The Journal of Occupational Diseases and Traumatic Surgery

Industrial Medicine

for

Physicians and Surgeons in Industry

Volume V NOVEMBER, 1940 Number 11

THIS ISSUE

The Workmen's Compensation Law
—And Its Influence on the Treatment of Cancer—

Gas Gangrene
—Plea for Better Prophylaxis—

Morphine-Scopolamine Anesthesia
—In First Aid Treatment of the Injured—

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—From a Transparent Plastic Wrist-band—

Shock
—Peripheral Circulatory Failure Associated with Trauma—

Disturbed Fluid Balance
—Dehydration; Edema; Acidosis and Alkalosis; Circulatory Collapse and Shock—

Industrial Health
—Symposium under the Sponsorship of the Department of Preventive Medicine, Medical College of Virginia—

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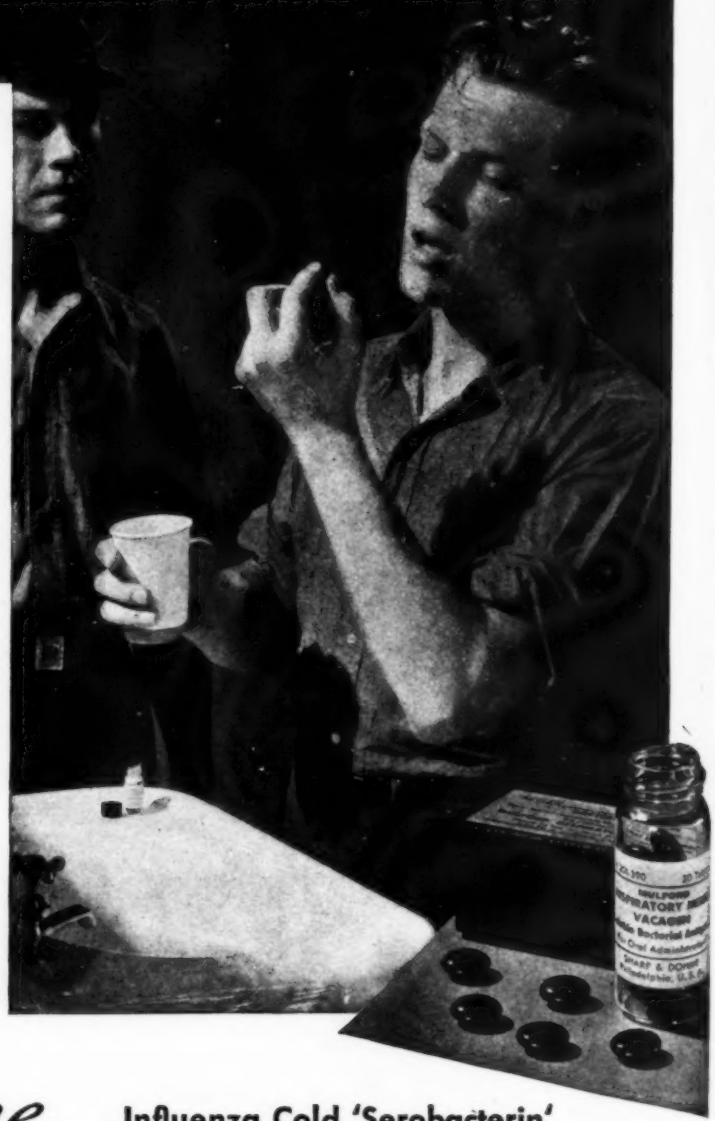

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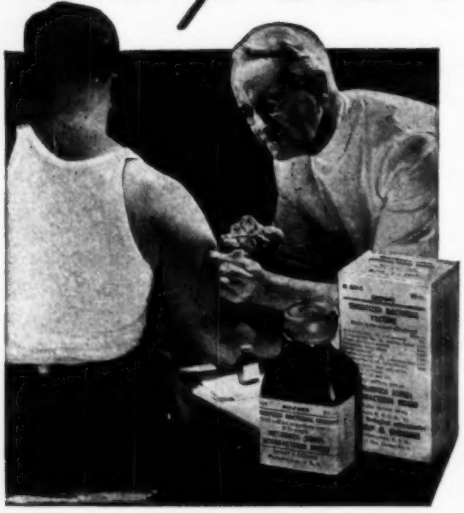

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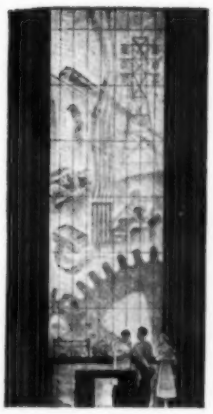

OCCUPATIONAL DISEASES
TRAUMATIC, INDUSTRIAL

INDUSTRIAL MEDICINE
& RAILROAD SURGERY

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INDUSTRIAL HEALTH and DISEASE:

INDUSTRIAL MEDICINE.....LORENZ W. FRANK, M.D. 575
—From the Standpoint of the Internist
(In "Rocky Mountain Medical Journal")

DR. EWING'S forthright expressions regarding the influence of the workmen's compensation law on the treatment of cancer, which begin on page 539, are superlatively interesting. May we be pardoned for finding even more so the one, on page 544, where he says: "There is a good journal of Industrial Medicine."

DR. HOLMBLAD'S plea for better prophylaxis as regards "Gas Gangrene" (page 544), has attracted wide attention. The reason will be apparent in the reading.

DR. MARSH'S "Disturbed Fluid Balance" (page 546) elaborates the maintenance of fluid balance in the body as a very important phase of physiology.

DR. MARCUS and DR. GROH (page 551) present a preliminary report on 10 cases of infection and osteomyelitis of the phalanges treated with x-ray.

DR. DEPREE emphasizes (page 554) the value of morphine-scopolamine in first aid treatment of the injured.

DR. SAPPINGTON (page 556) reports the Symposium on Industrial Health recently held under the sponsorship of the Department of Preventive Medicine, Medical College of Virginia.

DR. J. W. DAVIS (page 565) summarizes very effectively a great deal of important information about "Hand Injuries."

DR. McMILLAN (page 561) discusses the highly important surgical and medical problem of "Shock."

DR. LEVIN (page 569) reports a case

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of "Contact Dermatitis" from a wrist-strap made of a transparent plastic.

Then follow, in order, the current article on "Medical Service in Industry" (page 570) sponsored by the A. M. A. Council on Industrial Health; some reviews by DR. HAYHURST; and announcements and programs relating to recent and imminent meetings of AIR HYGIENE FOUNDATION, AMERICAN CONFERENCE ON INDUSTRIAL HEALTH, NEW YORK STATE SOCIETY OF INDUSTRIAL MEDICINE, and the CHICAGO and CENTRAL STATES SOCIETIES OF INDUSTRIAL MEDICINE AND SURGERY.

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Then, with republication of an interesting and well-written study of "Industrial Medicine from the Standpoint of the Internist" (page 575) by DR. LORENZ W. FRANK another issue of INDUSTRIAL MEDICINE comes to close.

Association Meetings

Air Hygiene Foundation

ANNUAL MEETING,
November 12 and 13, 1940,
Pittsburgh, Pennsylvania.
(Program on page 572.)

American Conference on Industrial Health

SYMPOSIUM,
November 14, 1940,
Chicago.
(Program on page 572.)

Central States Society of Industrial Medicine and Surgery

ANNUAL CLINICAL MEETING,
December 6, 1940,
Chicago.
(Program on page 573.)

American Association of Industrial Physicians and Surgeons

TWENTY-SIXTH ANNUAL MEETING,
Week of May 5, 1941,
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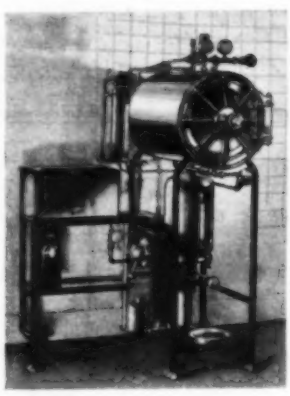

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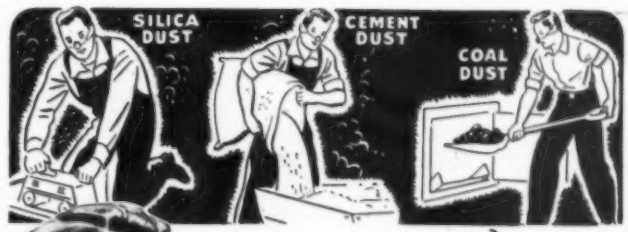

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With which are consolidated "The Industrial Doctor" and "International Journal of Medicine and Surgery."

The Science, the Law and the Economics of Industrial Health

Volume 9 NOVEMBER, 1940 Number 11

The Workmen's Compensation Law

—*Influence on the Treatment of Cancer*—

JAMES EWING, M.D.,
Consulting Pathologist, Memorial Hospital,
New York City

DURING the past two decades the wide extension of the Workmen's Compensation Law has exerted a notable influence on the practice of medicine and on the attitude of the public. Much of this influence has been highly desirable since medical care has been more readily obtainable by a large class of the population and economic hardship entailed by injury and disease has been mitigated or avoided. Thus the laudable intent of the law has been to a considerable extent realized. On the other hand it could hardly be expected that the annual distribution of several hundred million dollars to a relatively uninstructed class of people, by hastily organized legal machinery, could be accomplished without introducing some unexpected and undesirable results. The first effect has been to improve the economic condition of the workman by assuring him of aid in case of accident or injury arising in his employment. His job thus became more desirable and anxiety for the welfare of his family was largely removed. With the increased wages gained during recent years this additional safeguard against accident, aided by the Social Security Act, has tended to improve the general status of the workman to such an extent that we now point with pride to this almost revolutionary advance in social conditions. At the same time a number of important secondary effects of the new laws have been produced, which have been undesirable and even destructive of economic efficiency and of public morals. Industry has had to bear a heavy burden from increased taxation and restricted conduct of business which necessarily shows itself in increased costs to the consumer. With these results the public is more or less familiar. Medical practice however meets the more serious of these secondary effects and has had to deal with them by a variety of resources with which the public is not familiar.

The assurance of compensation for injury leads the workman to relax his sense of personal responsibility. It probably leads to an increase in the number of accidents although I know of no statistical proof of this fact. More definitely it leads to the assumption that injury is in some way or other substantially concerned with ordinary disease to an extent not previously conceived and not supported by sound medical knowledge, and it places a premium on the search for such possible relations by claimant and physician. Thus the whole problem of the relation of injury to disease has been reopened with increased impetus toward the close relation between injury and disease. Very few workmen are unaware of the advantages of espousing the doctrine of a traumatic origin of disease and its complications. The administration of the law brings into existence a great number of lawyers and physicians, who devote much or all of their time to the vast detail of study and adjudication of industrial injuries, and in all this activity personal interests are necessarily involved. I believe that it is the general verdict that the compensation courts have developed methods of procedure and standards of efficiency of a rather high order. In fact it appears that medical evidence receives more competent consideration in the average compensation court than in a civil court where strict rules of evidence tend often to suppress the essential medical facts. The compensation courts are seldom guilty of the gross miscarriages of justice and violations of common sense, which frequently shock physicians when suits for damages from injury are submitted to lay juries.

Presented at the Seventeenth Annual Meeting of the ASSOCIATION OF SURGEONS OF THE NEW YORK CENTRAL SYSTEM, September 25, 1940.

It is difficult to ascertain the total cost of the compensation law. From 1925 to 1939 the total awards ran between 33 millions and 22 millions and average about 30 millions. The cost of administration by the state averages about 5% of the total awards, or $1,500,000.00. The awards and the cost of administration are paid by the insurance companies. The charges to insurance companies for conducting their compensation business and for legal and medical fees seem not to be available, but are of much interest in estimating the adaptability of the law. In 1938, $8,719,803 were awarded in New York State for 78,000 industrial accidents; a total of 460,939 accidents were reported; 392,553 hearings were held by 32 referees; and 49% of the claims were disallowed.* A remarkable increase in the business of accident insurance has grown up calling for the services of a large number of lawyers, physicians and assistants in the conduct of their work. In this field it is the general belief that the adoption of sound ethical principles and high specialization of personnel has produced machinery which works with reasonable efficiency. The total cost to the community of all this complex and new social economic effort is difficult to determine. From the background of this brief review of the progress of a truly great humanitarian program one may properly inquire in more detail into the workings of the scheme and how it influences especially the progress of our knowledge of legal medicine and its problems. I propose to confine my observations to the field of neoplastic diseases although many of the relations of trauma to cancer find a counterpart with other diseases.

THE greatly increased number of compensation cases observed by physicians and pathologists of the more critical type has not strengthened the basis of the traumatic theory of cancer nor greatly added to the number of fully attested cases of traumatic cancer. On the contrary, the discovery of many active carcinogenic chemicals, the enlarging scope assigned to hereditary influences, and the recognition that the growth of tissues and organs is determined mainly by functional stimuli and internal secretions have definitely weakened the traumatic theory and made it more difficult to establish a traumatic origin of malignant tumors. The old theory of chronic irritation of non-specific types as causes of atypical growth has been replaced by the conviction that there must be some specific factor at work before trauma may be assumed to be connected with the origin of any cancer. The specific factor then becomes the true exciting cause and the trauma secondary and unessential. Moreover the conditions of origin of many major forms of cancer are now rather well established to the exclusion of trauma. Mammary, uterine and ovarian cancers are known to result from the action of sex hormones, giant cell tumors of bone in the adolescent arise on the basis of parathyroid activity, and osteogenic sarcoma in the adult chiefly as a terminal event in the progress of Paget's disease. In both age periods hereditary influences must be included. The causes of pulmonary cancer must probably be referred to long continued action of specific irritants either inhaled or possibly excreted in the lung. The late effects of sunlight, hereditary influences, and the late results of chemical medication lie at the bottom of most cancers of the skin. The list of congenital abnormalities in structure which lead to tumors has steadily increased in recent years, but is imperfectly realized by most physicians and many pathologists. At the same time routine clinical observation, and many planned experimental efforts to produce cancer, by simple trauma, have failed to contribute any additional evidence in favor of trauma. Under these circumstances the older statistical contributions on traumatic cancer have been discarded as worthless and any recent current report which is unsupported by critical analysis should receive scant attention.

In most compensation courts these general facts about cancer causation are receiving more and more recognition, so awards are being made chiefly on the ground of aggravation rather than on primary causation. On the other hand it does not appear that our knowledge of the conditions of origin of cancer is sufficiently complete to warrant the exclusion of trauma as an occasional precipitating factor in the outbreak of disease. Indeed one may properly assume trauma as possibly a frequent essential element in predisposed tissues, so that in all such cases it becomes necessary, under the conditions of the compensation law, to exclude the traumatic element by a close analysis of all the features of the case. It has been my experience that there is generally little difficulty in eliciting facts which are inconsistent with a traumatic origin. These facts relate chiefly to the type of the tumor, the time intervals, the duration of the disease, and especially the work of the medical detective in unearthing previous symptoms of disease. Many a long speculative debate is rendered superfluous by the introduction of some simple concrete record of previous disease, and the chief source of divided opinion in the average case is found in the inadequate record of the first attending physician. For this reason physical examinations and health records of all employees should be invariable and mandatory in all industrial organizations and very competent observations of the immediate effect of trauma and the early course of symptoms should receive minute attention. Here the radiograph is the chief reliance, but many routine laboratory tests often prove of decisive value. If these precautions were taken it would not be so often necessary to assume the previous integrity of the injured tissue as is now generally accepted on the unsupported statements of the patient. In the present state of our knowledge I believe that the medicolegal investigator should take a very liberal attitude toward the question of traumatic origin of tumors and assume that a substantial trauma may possibly be con-

* Special bull. Dept. of Labor, November, 1937. Guide to Workman's Comp. Margulies, Blum. N. Y., 1939.

nected with the origin of a considerable variety of malignant tumors, the causation of which must be mainly assigned to other causes. Having adopted this liberal attitude one may with equal justice insist that all the proved facts in the case must be consistent with a traumatic origin.

We do not know exactly what happens in the healing of wounds of various organs in all classes of subjects. Pathologists generally agree that a single wound acting alone on normal tissue is never followed by a malignant tumor, but there are great variations in apparently normal tissues, many precancerous lesions, much diversity in the physiology of the individual, some curious predispositions, many complications of wounds healing, and all of these factors may contribute to and alter the result of injury. There is great need of much close observation of the healing of wounds of organs from the medicolegal standpoint, and this type of critical study should replace reliance on superficial clinical observation.

The chief result of injury which may possibly lead to atypical overgrowth is hemorrhage. The granulation tissue which arises in the absorption of a blood clot is usually active and normal, ending in cicatrization, but it is well known that granulations tissue sarcomas sometimes follow lacerating wounds. The exact conditions leading to this process are not known, but the wounds are usually infected. In bone subperiosteal hemorrhage may be followed by an exuberant overgrowth of osteoid tissue terminating in trabeculated bone formation and much fusiform thickening of the shaft. In football injuries the reaction often becomes extremely profuse, involving muscle, bone, periosteum and blood vessels, and yielding a structure which it is difficult to distinguish from osteogenic sarcoma. Such observations warrant the acceptance of certain cases of osteogenic sacroma as traumatic. My own studies do not favor the possibility that epithelial tissues may respond to hemorrhage in the same vigorous manner, but indicate that disordered gland cells in blood clot tend rather to atrophy.

I have recently had opportunity to follow the course of a severe injury to the breast, from an automobile accident in which the breast was severely lacerated and infiltrated with blood. An indurated swelling persisting in the injured area led to a biopsy, which disclosed a cavity containing disintegrated blood and lined with very active and somewhat atypical granulation tissue. In the neighborhood there was fat necrosis, fibrosis and much disorder in the ducts and acini showing that the epithelium had been fully exposed to trauma. A few weeks after the biopsy there was renewed induration and a second biopsy disclosed a low grade but definite spindle cell sarcoma. A wide local dissection of the whole mass was then done, but the disease recurred as a peculiar diffuse spindle cell sacoma, which recurred after mastectomy with a fatal result. This sarcoma was quite different from the usual type of spontaneous sarcoma of the breast which arises from fibromas and presents a peculiar embryonal structure with very hyperchromatic cells. I refer to this case as probably a genuine example of traumatic sarcoma of the breast and would point out especially that the epithelial elements failed to exhibit the slightest tendency to atypical overgrowth but suffered atrophy. Here is one case of atypical result of trauma to the breast, and it does not support the view that trauma may produce a carcinoma of the breast.

The type of the tumor often precludes any reasonable probability of a traumatic origin. In the breast one would expect a traumatic cancer to show the infiltrating structure of disordered and displaced epithelial cells, carcinoma simplex, but not a papillary adenocarcinoma or comedo carcinoma or an embryonal adenoma or any of the well known mixed tumors, or the general features of cystic disease, all of which lesions are best assigned to other causes. The great majority of organ carcinomas present a structure which may not reasonably be the result of trauma, and here may be mentioned mixed tumors of parotid, teratoma testis, carcinomas of nasal sinuses, larynx, lung, liver, kidney, many of which are often attributed to injury.

THE time factor furnishes the chief ground for positive exclusion of traumatic origin of tumors. Immediate examination may reveal radiographic signs of a well established destructive lesion in bone, or a palpable tumor, or pronounced recent loss of weight, or clinical signs of long standing disease, which could not possibly result from a recent injury. While the rate of growth of malignant tumors may not be decided from histological examination within exact limits, yet the clinical course and rate of growth are well known for the majority of tumors and may generally be fixed within certain definite limits. The careful examination of the whole organ or tumor removed at operation or autopsy often proves a source of decisive information regarding the origin and duration of the growth which is very frequently neglected. The pathologist who reports on medicolegal material should never fail to make his examination complete and should not merely report on the structure of the tumor. Cancer almost never arises in normal tissue but in tissues which are long the seat of pathological change which contributes essentially to and may fully explain the origin of the growth. In the breast there are usually signs of chronic mastitis with cysts, scars, stagnation, papillomas, miniature adenomas, which are adequate sources of the cancer. In the organs, as liver, pancreas, lung, kidney, etc., there are usually old chronic changes which are known to lead to cancer. Carcinoma found associated with such changes may not reasonably be referred to a possible theoretical traumatic origin.

It is a well recognized principle that trauma seldom initiates cancer but frequently brings to light pre-existing disease. This principle cannot be too strongly emphasized, but it is very frequently ignored. Trauma tends to bring about

injuries to the tumor bearing area, which would not occur in a normal tissue and to exaggerate the symptoms thereof. I have previously stressed this fact and suggested the designation of the principle as "traumatic determinism." Lumps in the breast are easily bumped, small tumors in bones about the joints tend to cause limping and falls, apoplectic attacks cause subjects of brain tumors to fall and strike the head, small tumors of internal organs are readily made painful by minor strains, tumors of the testis are nearly always first detected by some slight injury, and in all cases the resulting pain is more severe than the injury would warrant. In many situations the local signs of trauma are more pronounced in the region of a tumor than elsewhere. Accordingly when the response to a minor injury seems exaggerated one should suspect that the injured tissue is already the seat of a pathological process and possibly a tumor.

The principle of traumatic determinism accounts for the considerable number of cases in which a pre-existing metastatic tumor is brought to light by the injury. These cases raise the question whether trauma may cause the localization of a metastasis which would not otherwise occur. This possibility must be admitted but only in the late stages of disseminated cancer in which vagrant cells are abundantly or occasionally present in the circulation. Burrows has shown how inflamed and regenerating tissues tend to sift out of the blood stream bacteria and foreign particles, and Rous has described how fowl sarcoma arises at the points of injury. There is no evidence that injured tissues have the capacity to concentrate any carcinogenic substances in the body, if such exist, and the localizing effects of trauma must be limited to cases in which tumor cell emboli are already present in numbers. Metastatic tumors discovered at the point of trauma are very frequently the first sign of a hidden primary growth which must then be located by general physical examination.

Peculiar coincidences occur which suggest a traumatic origin of a tumor but which must be assigned to mathematical probability. More than a million tumors arise in the general population of the United States annually, more than 8,000,000 disabling accidents occurred in the United States in 1933, and many more millions of minor accidents, so that the chances of a coincidence of trauma and tumor are substantial. Some of these coincidences are quite astonishing. There is a record that a child was run over by an automobile in front of a hospital. The presence of bloody urine led to immediate laparotomy and the discovery of a Wilms tumor of the kidney. Early carcinoma of the testis has occasionally been found in undescended testes removed during operation for hernia. The silent period of growth of most tumors is considerable and during all this time the tumor is subject to trauma. The duration of many gliomas of the brain is from six to eight years, and any trauma sustained at any time in this period may be assigned as a possible cause of the tumor. It is sometimes held that trauma may excite the growth of a slumbering tissue rest. This possibility must be granted, but no definite evidence in support of the view that any organ tumors as of kidney, lung, intestinal tract have been incited to growth in this manner is available. Such tissue rests are under the control of functional stimuli and hormones.

A VERY serious objection to the compensation law is found in the delay which the history of trauma entails in the correct diagnosis and prompt treatment of the case. Very few cases of cancer suspected of being traumatic receive prompt diagnosis and immediate treatment. I have records of scores of cases in which the patient lost his best or only chance to control the disease by surgery or radiation because of the history of trauma, and many of these cases lost their lives for the same reasons. When the physician is confronted by a definite history of trauma his clinical judgment is biased and he generally pursues this diagnosis until the signs of cancer are obvious and often until the condition is hopeless. This unfortunate result occurs with all classes of practitioners and in institutions of the highest type. One of the most elaborate studies of a brain tumor that I have even seen was produced in a notable neurological hospital under the diagnosis of traumatic hematoma and during a period of three months when the true condition, clearly indicated from the beginning, forced itself upon the physicians in charge. Here a large accident insurance placed a high premium upon establishing the traumatic nature of the condition.

The practice of allowing the patient to choose his own physician often leads to the choice of an incompetent doctor who spends much time in hunting evidence in favor of trauma, and avoids the expense of treatment until it has been decided by the court whether the case is compensable. In many cases the claimant is content to rest in comparative comfort in a free hospital bed or spend the winter in Florida with the approval of his physician whose fee is assured, but who makes no effort to establish the true non-traumatic diagnosis. The insurance companies have little opportunity of correcting these conditions because their agents are regarded as hostile by patient and family, and a confidential relation between patient and physician is impossible. The persistance with which these traumatic interpretations are maintained indicates that the medical profession is not yet cancer conscious. In fact it would be advantageous if in all cases of injury of the less serious grade the history of trauma were ignored, and some other hypothesis adopted until the exact nature of the condition is fully determined. The unfortunate consequences to cancer patients resulting from the disturbing influence of a traumatic history, genuine or fabricated, have reached such large proportions as to constitute a grave defect in the working of the compensation law and call for some efforts at readjustment by governmental authorities.

Another defect inherent in the present compensation law and applicable to all classes of disease relates to the aggravation of disease by trauma. Most of the awards in cancer cases are based on aggravation, and the debate of this question is generally inordinately lengthy, highly speculative, often incompetent, and seldom decisive. The meaning of aggravation has never been determined and probably cannot well be defined in exact terms. When a tumor is traumatized even slightly it becomes painful from tearing of tissues and hemorrhage. Such damage of minor nature generally heals in a few days or weeks and the results are temporary. Yet it cannot be said that the temporary pain benefitted the patient. If the law is loosely interpreted all such injuries may be accepted as aggravating the condition and the compensation law becomes a form of health insurance. This situation has been frankly reached in the case of cardiac thrombosis in the State of New Jersey where awards are regularly given for cardiac attacks occurring in the course of employment. In cases of advanced cancer the conditions are peculiarly favorable for a minor injury to bring to light pre-existing disease and produce temporary disability. When the suspicion of a grave disease is then added the patient loses courage and may never have another good day after the traumatic incident. In like manner the patient often associates the beginning of his disease with some slight over-exertion, or straining at stool, or a particular indigestible meal, or even the receipt of bad news. It is characteristic of many forms of internal cancer as lymphosarcoma, cancer of lung, and cancer of the stomach, that the disease progresses silently or without obtrusive symptoms, the patient continues at work in fair health, until a critical period is reached when pressure on vital structures or hemorrhage or infection or closure of hollow viscera develops suddenly. At this point any minor injury may precipitate or be coincident with the critical event and aggravation is assumed and an award made for a patient who has only a few weeks to live in the normal course of events. Compensation then becomes health insurance in the terminal stages of necessarily fatal disease. These inconsistencies could be avoided if aggravation were defined as the introduction by substantial trauma, at a distinctly precocious period, of complications or new features of the disease which do not belong there. Such an interpretation would recognize the temporary nature of the effects of minor injuries of tumors and would exclude awards in most of the cases of advanced and terminal cancer. Such would seem to be the intent of the law. In all such cases a wide latitude of judgment must be exercised by the referee, but here lies an inherent defect in a law which entails more or less arbitrary decisions in medical questions. A remedy might possibly be found by referring such cases to a competent medical commission, but the expense and practical difficulties in administration of such a commission do not encourage the adoption of such a plan. When one considers the disastrous result which the compensation law entails by delays in diagnosis and treatment and reviews the inequities connected with the theory of aggravation of cancer, together with the enormous expense of administration, one is much inclined to conclude that better results might be obtained by substituting a frank system of health insurance for the present compensation scheme in this field of medicine.

Lack of cooperation on the part of the patient and family often adds to the difficulties of diagnosis and treatment and may effectually thwart competent efforts in the study of the disease. As a rule systematic studies in obscure cases are furnished by the insurance companies at considerable cost, and yet they appear to the anxious subject as directed against his financial interests. Lack of an autopsy leaves many cases in complete obscurity and while one may not urge mandatory autopsies it is not too much to suggest that compensations courts would render a valuable service, as they sometimes now do, by stressing the need of autopsies. There is need and opportunity to secure greater mutual confidence between insurance companies and the working man and his family. I have not yet found any insurance company deliberately attempt to escape responsibility for cancer or its aggravation. On the contrary it is the general experience of physicians employed by these companies that liberal arrangements are obtainable and urged in order to facilitate diagnosis and to carry out urgent treatment by the most competent methods during the initial period before the true nature or origin of the condition is determined and the responsibility of the company established. These facts should be generally known and accepted by physicians and their patients.

IN VIEW of the vast increase in the material resources which have been turned into the field of legal medicine, especially in relation to traumatic conditions, by cities, states, insurance companies and industrial corporations, one would expect to find a corresponding improvement in the organization of this branch of medicine. Most other medical specialties are supported by courses of instruction in medical schools or postgraduate hospitals, admission to these specialties is endorsed by special national boards of examiners, a voluminous literature is produced, local, national and international societies meet regularly and discuss cases and problems, many special hospitals provide favorable conditions for clinical and laboratory work, governments contribute necessary funds for the support of these activities, and in the case of cancer most states now have special branches in the Health Department which concern themselves with prevention, treatment, research and statistical study of cancer in many of its relations. While great improvements in the organization of general industrial medicine have been accomplished, especially by industrial organizations, legal medicine still remains the stepchild of the medical profession, while governments contribute chiefly to its burdens and university

medical schools have looked steadily askance. The expansion of the Workman's Compensation Law has emphasized many of these conditions. There is a good journal of Industrial Medicine, but there is no publication which collects observations and contributions on the specific problems of traumatic disease. One looks in vain for local societies which review the immense number of current cases, observations and decisions in traumatic disease. There are some excellent recent textbooks most of which endeavor to cover too large a field to insure the full confidence of the reader. There can be no universal medicolegal expert. There are remarkably few contributions from accredited research laboratories on subjects relating to trauma. Eminent specialists still endeavor to support unproved hypothesis by a multitude of superficially reported clinical reports of cases. There are few chairs of legal medicine in university medical school. There is not a single well organized institute of legal medicine in the country. During the past 40 years several plans for the establishment of such an institute in the city of New York have been carefully prepared but without any concrete result to date. Since governments, municipal, state and national, have created by new laws many of the responsibilities now discharged by the unaided medical and legal professions, it would seem reasonable that governments should contribute to the support of medicolegal science and its institutions. Signs of such governmental support might well initiate renewed effort on the part of the many institutions which are interested in the study and pracice of legal medicine. In the field of cancer, for which I may speak, there are many general activities which the state and Federal governments might well undertake and which could well replace their excursions into the field of curative medicine. There are already in existence several governmental institutions which might well devote a portion of their resources to the problems of legal medicine and especially to those relating to cancer. The State of New York Department of Health has a division of cancer control with a substantial budget. It could properly undertake a statistical and critical investigation of the workings of the compensation law from the legal, economic and medical standpoints, and similar bodies in other states could do likewise in their communities. Much valuable information and guides to reform would be made available. The National Cancer Council has established at Bethesda, Maryland, a broadly organized and liberally supported cancer research laboratory and has undertaken several elaborate statistical studies of cancer. It supports educational projects and supplies many research fellowships, but has neglected traumatic cancer. There are many problems in laboratory research in the cancer field of medicolegal and general interest which it is equipped to pursue. Among these may be mentioned:

Effects of trauma on various animal tumors;

The types of atypical overgrowth arising after trauma of various organs;

Experimental studies on the localizing effects of trauma on metastases;

The isolation of carcinogenic agents in mesoblastic tumors which are assumed to arise after trauma;

A search for carcinogenic agents, e.g., the "necrose hormones" postulated by Caspari, or other growth stimulating substances in traumatized tissues;

The critical selection and recording of authentic cases of traumatic tumors in the human subject. Considering the expansive program adopted by the Federal government in recent years and the somewhat random distribution of great sums of money for projects of questionable value, those who are interested in legal medicine and traumatic cancer may express regret that an Institute of Legal Medicine has not been established in Washington. It could derive support from the Army Medical Museum and the Surgeon-General's library. A similar responsibility confronts the City and the State of New York, for New York City is probably the best location for a broadly organized and practically effective Institute. The fact that such a project has not been forwarded indicates that the forces of legal medicine are not well organized.

Gas Gangrene

—Plea for Better Prophylaxis—

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SEVERAL observers, such as H. B. Macey, B. Malone, Ellsworth Eliot and others, have called our attention to the fact that cases of gas gangrene infection occasionally develop following trauma in spite of the administration of a prophylactic dose of gas gangrene antitoxin.

Our own experiences confirm these observations. The belief that some cases of crushing injury and compound fractures are still not being given the benefit of extensive early debridement and the adequate prophylactic dosages of gas gangrene antitoxin justifies the presentation of this subject at this time.

Gas gangrene is an anerobic wound infection which, despite the various prophylactic measures used today, still causes a great number of deaths throughout our country. Though recognized many years before the World War, the extensive and costly experience gained by the surgeons at that time served only as a warning of the intensive and diligent early treatment which contaminated wounds require, if they are to escape this dread infection.

We see today many cases which are not entirely different from the cases which were treated during the war. Surgeons in large city hospitals, railroad surgeons, industrial surgeons, as well as the general surgeon in the smaller community, all see

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cases nearly every day, which clearly indicate meticulous early care. Gunshot wounds, puncture wounds, compound fractures and deep gouging injuries are the main offenders, but let us not forget the more often overlooked diabetic ulcer, automobile accident laceration, and amputation for diabetic or arteriosclerotic gangrene as the portal of entry of this infection. The accepted method of treatment of compound fractures is constantly being presented to medical societies by great leaders of our profession. Their plea is for not only consideration of the fractured bones, but careful thorough soap and water cleansing of the skin and shaving of the hair about the wound, gentle mechanical cleansing of the wound and irrigation with a large amount of warm saline. Following this one should do meticulous debridement of all mangled devitalized tissue and careful search and removal of any foreign substance. Some of these wounds will contain deeply embedded foreign bodies, such as slivers of wood, pieces of clothing, dirt and grease. Every effort, in a careful and gentle manner, must be carried out to remove these germ bearing particles. Pockets under the skin, especially along the periosteum, in cases where a splinter of bone may have been thrust through the wound must be located and irrigated gently without sufficient force to cause deeper lodging of these contaminated particles and bacteria. Loose closure of these wounds is the best procedure, and is advocated by many. Drainage tubes only seem to enhance infection and unless they are very loose, may cause pressure on the already damaged tissue which, because of the injury, lacks a good free blood supply. Beware of devitalized and traumatized muscle tissue as the greatest potential site for gas gangrene infection to develop.

Considering that the injured patient has had the benefit of an early adequate thorough debridement, one is next confronted with the problem as to whether prophylactic gas gangrene antitoxin should be given. Several manufacturers of biologicals have on the market the combined tetanus antitoxin and gas gangrene antitoxin usually labeled "prophylactic dose." These are most commonly 1500 units tetanus and 4000 units of gas gangrene antitoxin of which 2000 units is the perfringens type and 2000 units Vibrion Septique antitoxin.

It is common practice and belief that 1500 units tetanus antitoxin is an adequate prophylactic dose to prevent tetanus, and usually this is true. Unfortunately, this same thought and belief is automatically carried over in the combined tetanus and gas gangrene antitoxin prophylactic package as it is being marketed at the present time. Many surgeons are prompted and led to believe that by this single injection they have adequately protected their traumatized patient against gas gangrene infection. Our observations and experiences convince us that this is not true and that the gas gangrene prophylaxis is not anywhere near as complete and dependable as the protection against tetanus. Whether this is entirely due to an inadequate dosage of antitoxin, or whether it might be due to the absence of antitoxin specific against some of the other 20 or more gas gangrene producing organisms is still uncertain. The fact that subsequent massive therapeutic dosages of perfringens and vibrion septique have in these cases effected recoveries, leads us to believe that the dosage is inadequate rather than due to the absence of the other types of organisms antitoxin.

It is, perhaps, unfortunate that the advantage of giving a single serum injection against tetanus and gas gangrene is more than offset by the danger of inadequate protection against gas gangrene infection.

When one reads the circulars and printed information accompanying the present day packages, this possible failure of protection is hinted and suggested but not adequately emphasized.

We have met this problem in our practice by giving the 20,000 unit therapeutic dosage of gas gangrene antitoxin instead of the small 4000 unit dose. It is a simple matter to give 1500 units of tetanus antitoxin separately.

It is true that the cost is more to do this, but it certainly is not prohibitive. The 20,000 unit package can be bought by most of us for $8.43 and should be purchased over the drug store counter for about $12.50 anywhere. This is cheap protection against any case of gas gangrene infection.

We feel that if prophylactic gas gangrene antitoxin is indicated at all, it is indicated in adequate dosage. This parallels the teaching of Dr. Archibald Hoyne in the treatment of diphtheria; that if diphtheria antitoxin is indicated at all, it should be given in doses sufficiently large to be effective.

In a recent case of amputation of a leg for arteriosclerotic gangrene we gave 40,000 units as a prophylactic dosage two days before amputation.

Still further in the observation of the potential gas gangrene case, one must not hesitate to take smears and cultures of these wounds on subsequent days as one will be occasionally rewarded by making diagnosis of gas gangrene infection a day or two before the usual clinical signs and symptoms manifest themselves.

We present the following cases illustrative of our above observations:

Case R. P.
Age 12 yrs; Date of injury May 11, 1937.
Nature of injury: Child kicked by a horse and sustained a compound fracture of the left tibia and other external abrasions and cuts.
Date of prophylactic injection: May 11, 1937.
Dosage: 1500 Units tetanus antitoxin.
2000 Units perfringens antitoxin.
2000 Units vibrion antitoxin.
Onset of gas gangrene infection on May 16, 1937.
Eventual outcome: Death May 18, 1937.

Case J. J.
Male age 40 yrs; Date of injury July 7, 1937, 6:00 P.M.
Nature of injury: Crushing auto street accident.
Patient sustained a severe crushing injury to the soft tissue of the right forearm with severance of flexor muscles and compound fractures of all the bones of the elbow. Shock and hemorrhage necessitated 1000 cc. blood, fluids, etc.
Prophylactic injection: July 8, 1937, at 3 P.M.
Dosage: 1500 Units tetanus antitoxin.

2000 Units perfringens antitoxin.
2000 Units vibrion antitoxin.

Patient moved to St. Luke's Hospital July 10, 1937, with local and systemic evidences of gas gangrene.

Treatment: 7-10-37, 60,000 Units antitoxin, I.V.
7-11-37, 20,000 Units antitoxin S.C.
7-11-37, 45,000 Units antitoxin I.M.
7-12-37, 20,000 Units antitoxin I.M.

Numerous longitudinal incisions about elbow, and continuous wet hydrogen peroxide and potassium permanganate dressings.

Eventual outcome: Recovery.

CASE M. C.

Age 54: Male: Date of injury 1-14-40; entered hospital 5:30 A.M.

Nature of injury: Quarry accident. Patient sustained a compound comminuted fracture of both bones of left leg. Prophylactic injections at 7 A.M. — 1500 units tetanus antitoxin, 5500 units mixed gas gangrene antitoxin. Gas gangrene bacilli demonstrated on 1-18-40 by smears.

Between 1-18 and 1-24-40 the treatment was 610,000 units of mixed antitoxin given entirely intramuscularly and subcutaneously.

By 2-3 three negative smears for gas bacillus had been obtained.

On 4-29 the patient developed a lobar pneumonia and meningitis. Death occurred on 4-30-40. Autopsy.

CASE M. C.

Age 30; Male: Date of injury 8-8-39; entered hospital 9:45 P.M.

Nature of injury: Right forearm caught in a milling machine. The patient sustained compound fractures of the radius, radiocarpal joint, ulnocarpal joint, multiple fractures of the metacarpal joints also multiple fractures of the metacarpals and phalanges. There was a severance of nearly all the extensor tendons of the forearm.

11:20 P.M. Operation consisted of careful and complete debridement of devitalized tissue after thorough cleansing and irrigation.

2:20 A.M. Transfusion 500 cc. whole blood.

4:00 P.M. 8-9-39 Prophylactic injection given.

Dosage: 1500 Units tetanus antitoxin.
2000 Units perfringens antitoxin.
2000 Units vibrion septique antitoxin.

Gradually fingers and hand became cyanotic and swollen.

8-14-39 Transfusion 500 cc. whole blood and guillotine type supra-condylar amputation.

8-15-39 Two immunizing doses of gas antitoxin of
4000 Units perfringens antitoxin.
4000 Units vibrion septique.

9-12-39 Skin grafted over healthy stump granulation.

Eventual outcome: Recovery.

Bibliography:

MALONE, B.: Gas Gangrene Prevention and Treatment. *J. Tenn. M. A.*, 30:402-405, October, 1937.

CAULFIELD, P. A.: Gas Bacillus Infections. *M. Ann. Dist. of Columbia*, 5, June, 1936.

MACEY, H. B.: Gas Gangrene. *Proc. Staff Meet. Mayo Clinic*, 14:180-183, March 22, 1939.

ELIOT, E.: Gas Gangrene. *Ann. Surg.*, June, 1935.

BATES, M. T.: Gas Gangrene. *Ann. Surg.* 105:257-264, February, 1937.

DAVIS, GEORGE G.: Gas Bacillus Infection. *Proc. Am. Ass. R. R. Surg.*, May, 1936.

OWEN, H. R.: Gas Gangrene. *Am. J. Surg.*, 44:39-45, April, 1939.

CALLANDER, C. L.: Gas Gangrene. *Am. J. Surg.*, 42: 811-23, December, 1938.

GHORMLEY, R. K.: *J. Bone & Joint Surg.*, 17:907-915, October, 1935.

Anaerobic Antitoxin. N.N.R. 1938.

Surgical Clin. N. A., December, 1939.

Disturbed Fluid Balance

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THE recognition of the full significance of fluid balance in the body is just now being obtained. The term fluid balance is used advisedly instead of water balance inasmuch as one may include in the former, electrolytes, protein and other substances in the fluid state, in addition to the water. The particular phase of physiology with which this paper deals is a very important one because there are several serious pathological states which, as we now know, are intimately tied up with and are more or less dependent upon a disturbance of the fluid balance. These disorders or syndromes are:

1. Dehydration;
2. Edema;
3. Acidosis and alkalosis;
4. Circulatory collapse and shock.

Dehydration

THE physiology of normal hydration is based upon several rather simple physio-chemical principles. These, with certain other factors which determine the retention of the proper amount of water in the individual, will be briefly reviewed at this point.

About 70% of the body weight is made up of water. Of this amount approximately 25% in adults, and 35% in newborn babies, constitutes the extracellular, while the remainder makes up the intracellular fluid. The former is the plasma constituent of the blood, the lymph, and the cerebrospinal and interstitial fluids, while the latter is the fluid medium within the cell bodies. These two fluids lie, so to speak, in different compartments which are separated by a semi-permeable membrane. The function of these fluids is the same, namely, to maintain a normal osmotic pressure in the body, to act as a conveyor of nutritive elements and internal secretions to and from the tissue cells of various parts of the body, to carry waste products and poisons from the cells to the eliminative organs, and to regulate body temperature.

It is in the electrolyte content that the intracellular and extracellular fluids differ from each other. The former contains, primarily, potassium, magnesium, phosphate and protein, while the latter contains very largely bicarbonate, chloride and sodium. The interchange of the fluids and the substances in solution, between the cells and the interspaces is brought about by osmotic pressure. Under normal circumstances this pressure is held at a state of equilibrium by the equal concentration of the monovalent ions, potassium within, and sodium outside, the cell bodies.

One striking feature of the process, which is a significant factor in the production of dehydration, is the fact that while the concentration of the Na ion may vary much under pathological circumstances, there is very little diffusion of the K ion from the cell. This fact makes possible the de-

velopment of dehydration even when the fluid intake is not materially altered.

Practical examples of such a situation are:

1. Burns, in which large quantities of the Na ion become fixed in the involved areas, and

2. Pneumonia, in which disease large quantities of the sodium element accumulate in the consolidated lung tissue.

By this process of localization the available Na ion is reduced in the extracellular fluids and dehydration develops while the water intake may be unchanged or adequate. As a result of the diminished sodium content of the extracellular fluids, water is drawn into the cell body by the constant (or practically constant) potassium ion concentration within. While it is conceivable that dehydration may result from an insufficient intake of water alone, practically speaking, it never occurs except when there is a depletion of sodium in connection with the water shortage.

The deficiency of the sodium may result, of course, from a long continued inadequate ingestion of the sodium salts into the body; however, the most frequent cause for this disturbance in hydration results from the prolonged and copious drainage from the body of the various salt-containing fluids. When one considers the composition of the gastric and intestinal secretions, the bile, urine, and sweat, he can clearly see how the marked loss of any of these fluids from the body might result in electrolyte depletion. These secretions and excretions may be considered modified extracellular fluids, the first three of which are normally reabsorbed, thereby bringing about the conservation of the electrolytes contained therein. When any situation arises in which there is a considerable loss of any of these fluids, there is a noteworthy diminution in the store of the available and necessary chloride and sodium ions, the loss of which will result in dehydration unless these elements are replaced in the equal quantity.

At this juncture it should be stated that depending upon the location in the alimentary tract from which the fluid loss originates, will be determined the particular electrolyte which is depleted thereby. For example, prolonged vomiting from pyloric obstruction usually results in an alkalosis as a consequence of the loss of the large quantities of the chlorides in the gastric juice. On the other hand, obstruction in the upper part of the small bowel (duodenal or jejunal portion) the loss of the acid and base elements is about equal. In drainage from an ileostomy, or in the fluid loss of diarrhea, the base depletion is greater and acidosis follows. In the surgical drainage of the gallbladder or bile ducts the alkali loss predominates with the tendency toward acidosis. In heat prostration, when brought about by excessive sweating over long periods of time, there is marked loss of water along with the two ions—sodium and chloride. These points are of significance because they govern, to a slight extent, some of the principles of treatment.

The possibility of the patient's developing the state of dehydration should be anticipated in all illnesses, particularly those associated with the loss of fluids as described above. The recognition of the existence of the condition may be arrived at in the ordinary study of any patient. The individual usually gives the history of having had prolonged vomiting, persistent diarrhea, profuse sweating, marked diuresis, an insufficient intake of fluids and food substance, or possibly the loss of body fluids through surgical drainage. Upon physical examination it is seen that the patient's eyes are sunken, the tongue is dry and there is diminished turgor of the skin. The pulse is likely to be small, weak, and rapid. There are signs of failing circulation with a dropping blood pressure. The laboratory data give the conclusive facts. The urine is found to be scant, highly colored, and of high specific gravity. There may be evidence either of acidosis or alkalosis. There is usually a decreased chloride output. The blood examination reveals the presence of hemoconcentration. The blood chemistry discloses that the plasma chlorides are low. There may be an increased or decreased plasma CO_2 combining power. There is often an elevation of the blood urea. Depending upon the nature of the case and its duration, there may be a high or low percentage of plasma proteins.

The treatment of dehydration may be considered under two heads: first, its prevention, and second, its active treatment when present. As stated before, all ill patients must be considered candidates for the disorder. With that in mind, therefore, it is imperative to make it a part of all treatment to see that the patients are given a sufficient quantity, not only of water, but of the electrolytes also. The question comes up then as to how the correct quantity of fluid is to be estimated. To follow the plan of Coller and Maddock makes the procedure a fairly simple one. This will be considered more in detail later.

The source of water supply for the body is: (1) from water ingested as such; (2) from water contained in the foods that are taken into the body; and, (3) water which results from the oxidation of the foods in the processes of metabolism. Water is eliminated from the body: (1) by way of the kidneys as urine; (2) in the feces; and (3) as water of vaporization which is lost in sweating and respiration. The estimated loss from the body in health is said to be approximately 2500 cc. in 24 hours. The temperature and humidity of the location and season may bring about considerable variation in the amount of water lost by vaporization. In illness the fluid loss is greater, as a rule, because of the associated pyrexia, vomiting, diarrhea, etc., which may be present. The functional capacity of the kidneys is a rather important consideration in determining the fluid requirement of an individual. Newburgh has shown that whereas in health only 14 cc. of fluid is necessary for the elimination of one gram of solid through the kidneys, when these organs are diseased the fluid requirement often is as much as 40 cc. per gram of solid. This fact demonstrates how the fluid re-

quirement may be raised almost 200% above that of the normal individual by this factor alone. In those cases in which the patient's condition is complicated by fever, hot humid weather, or hyperthyroidism, Coller and Maddock suggest a minimal daily fluid intake of 3000 to 3500 cc.

In medical cases, the supply and the replacement of fluids and electrolytes often can and should be accomplished by the oral administration of the necessary elements. Frequently, however, nausea and vomiting are present either as a result of the dehydration or as a result of the primary disorder which has led to the depleted state. In these instances parenteral administration of fluids should be resorted to and no attempt made to supply the needed materials per orum, as the former procedure will obviate more vomiting with the further loss of electrolytes. In surgical cases, in the absence of other complicating factors such as loss of body fluids by vomiting, diarrhea, surgical drainage, etc., the fluid balance may be maintained by the administration of 500 to 1000 cc. of Ringer's solution in the morning and the balance of the fluid supplied as either 5 or 10% glucose in distilled water. In those cases wherein the electrolyte loss is greater because of vomiting, etc., an effort is made actually to measure all of these losses and give an amount of normal saline equal to the total quantity lost. The balance of the fluid is supplied as 5 or 10% glucose.

In those instances in which there has already developed an appreciable fluid and electrolyte loss, the problem becomes that of replacing the loss and then carrying on a sufficient daily administration to maintain a normal fluid and salt balance in the body. The degree to which the electrolyte depletion has extended may be estimated accurately enough by the plasma chloride determination. The normal value is 560 to 630 mgm. per 100 cc. of blood in the terms of sodium chloride. The determination of the total base loss (i.e. the sodium loss) is not practical because of the complicated chemical tests involved. A very satisfactory idea can be obtained as regards the amount of base available by the determination of the plasma CO_2 combining power. In the event there has been a marked loss of base from the tissues, the CO_2 combining power will be low, whereas if the chloride loss has been much more marked, the CO_2 combining power will be elevated above the normal. Another point to which attention has been directed is the fact that when the plasma chloride is found to be low, even in the presence of a normal plasma CO_2 combining power, there is a depletion of the sodium ion. In these instances in which there is a depletion of electrolytes, although there is an excess of either the acid or base element, nature does not eliminate the ion which is present in relative excess. This fact accounts for the development of acidosis or alkalosis seen in disturbed electrolyte balance. It is known also that in the presence of dehydration, water is excreted more slowly than normal though the sodium and chloride content of the urine is low. This observation is quite important from the standpoint of therapy as it reveals the fact that, in order to restore normal kidney function in dehydration, salt is necessary.

It makes little difference in therapy whether the loss of the Na ion or the Cl ion predominates, unless there is rather marked reduction in the plasma CO_2 combining power. The administration of the normal saline solution usually is sufficient and effective inasmuch as the excess ion is promptly and satisfactorily eliminated by way of the kidneys if these organs are in a healthy state and if sufficient water is administered with the salts.

In order to replace quantitatively the sodium chloride depletion, one may administer .5 gm. sodium chloride per kilo of body weight for each 100 mgm. per cent the plasma chloride reading is less than 560. Such a calculation is advisable particularly in those cases in which the kidney function is low.

Up to this point nothing has been said about the intracellular changes that go along with dehydration. Associated with the loss of chloride and sodium there is an increased excretion of the potassium, phosphate, and nitrogen from the body. Darrow believes that these substances are eliminated in excess, only as a result of tissue breakdown or destruction, and not as a compensatory feature of electrolyte balance. This being the case, the restoration of normal intracellular electrolytes is a matter of nutrition, i.e., supplying the proper food elements, and not merely the replacement of a given quantity of water containing a certain concentration of magnesium, phosphate, and potassium.

Edema

THE converse of dehydration is edema. The development of the latter condition may be the result of several types of abnormal physiology, but in the vast majority of instances it results from: (1) disturbed electrolyte balance, (2) cardiac failure, or (3) hypoproteinaemia.

We have already discussed the production of intracellular edema which occurs as a result of the decrease in the extracellular sodium ion concentration. This type of edema differs from the ordinary edema due to electrolyte disturbance and is brought about by an exactly opposite condition. The presence of an excessive concentration of sodium chloride in the interstices gives rise to the abnormal retention of water in the tissue spaces. The increased concentration of the salt in the body results from the decreased functional capacity of the kidneys occurring as a part of nephritis or from any other cause. The retention of water in the interstitial spaces is an effort on the part of nature to restore the normal osmotic force which has been disturbed by the excess of the extracellular sodium ion over the intracellular potassium ion concentration.

The treatment of edema associated with the condition described above would be: (1) the elimination of salt from the food or the parenteral

injections; and, (2) the administration of large quantities of fluid in order to enable the kidneys to bring about the satisfactory elimination of the solids which are being retained.

It must be remembered that edema of cardiac origin is not associated with sodium chloride retention unless there is kidney insufficiency complicating the decompensation. In cardiac failure the edema is due to the lack of force behind the blood stream which allows the water-logging to develop. There is no need, therefore, to decrease the salt intake in these patients, although a moderate restriction of fluid may be advisable. The elimination of the excess water via the kidneys by means of diuretics, as a part of the treatment of the failing heart, is the main indication in this type of edema.

The third type of edema is that which results from hypoproteinaemia. In this condition there develops, as a result of the lowered serum protein, a decreased osmotic force within the blood vessels which allows the passage of water into the interstitial spaces to equalize this difference in pressure. The edema level of the serum proteins is 4.5% while the normal level is 7%. Those conditions which result in hypoproteinaemia are: (1) failure to or inability to ingest, digest or absorb protein, (2) nephrosis, (3) excessive serum loss from any cause.

The treatment of this type of edema consists of the replacement of the serum protein (1) by intramuscular or intravenous infusions of plasma, (2) by transfusion, or, in those cases in which the demand is not urgent, (3) by high protein feedings.

Acidosis and Alkalosis

THE mechanism by which the normal body alkalinity is maintained is based upon a very simple but quite effective principle of chemistry. The reaction of the blood is protected by three lines of defense, which are: (1) the buffer systems of the body, (2) the elimination of carbon dioxide by the lungs, and (3) the excretion of the fixed acids by the kidneys and the bowel. It is by means of the buffer or tampon action of the base bicarbonate, the alkaline phosphate and the alkaline proteinate that the several acid substances formed in or introduced into the body are neutralized and the normal pH of the body is maintained in health. It is the quantity of the available Na ion which determines very largely the amount of the bicarbonate present and the total alkali reserve existing. When the quantity of disassociated Na ion is reduced the "chloride shift" occurs releasing more of the sodium element for the formation of additional base bicarbonate. The carbonic acid concentration in the blood, on the other hand, may be raised or lowered as the situation demands, thereby taking care of any excess of base obtained in the body fluids. In certain disorders, such as in diabetic acidosis, wherein there is a marked production of acid substances, or in such instances as prolonged diarrhea, or copious bile drainage, etc., in which there is an excessive loss of base, the buffer reserve may be considerably decreased with serious subsequent events. The production of either acidosis or alkalosis by the excessive loss of sodium or chloride, respectively, has already been dealt with and requires no further discussion except to reiterate that very often acidosis and alkalosis are merely manifestations of electrolyte deficiency or imbalance. One point worthy of mentioning in this connection is the possibility of the development of inorganic acidosis complicating the presence of diabetic acidosis. Unless the existence of this complication is anticipated and watched for, the patient may, under treatment, clear of the organic acidosis and still pass into circulatory failure or die as a result of the inorganic acidosis.

The loss of bicarbonate by way of the kidneys may predispose to the development of acidosis. Hartman has reported two such cases. Owing to the inability of the tubules to reabsorb the bicarbonate in the process of urine formation, the loss of the buffer substance allowed the early development of acidosis. In such cases the almost continuous administration of bicarbonate may be necessary.

In the treatment of a disturbance of electrolyte balance it is usually sufficient to administer large quantities of sodium chloride in the form or normal saline solution. If sufficient water is administered the normal kidney has no difficulty in eliminating remarkably large excesses of either the sodium or chloride ion, as the case may be. Experiments show that patients with healthy kidneys can eliminate satisfactorily 1200 to 1500% of the normal requirement of sodium chloride. However, in those cases in which there is a very pronounced loss of the basic element (the sodium ion) as indicated by a marked decrease in the plasma CO_2 combining power, it is advisable to overcome this deficiency by administering either a sterile solution of sodium bicarbonate or sodium r lactate intravenously. By calculations based upon the plasma CO_2 combining power and the weight of the patient, the amount of sodium bicarbonate necessary to overcome the acidosis may be easily determined. Hartman advocates the use of 1/6 molar sodium r lactate in all types of acidosis. Below is the formula suggested by Hartman for determining the quantity of normal sodium r lactate required for a given individual.

$$mM = \frac{(60 - CO_2)\ 0.7\ W}{2.24}$$

In the above equation mM represents millimolars; CO_2 represents plasma CO_2 reading, and W the weight of the patient in kilograms.

It must be remembered that in all such cases large quantities of fluid, at times a total of 5000 cc. in 24 hours, are necessary to restore the fluid balance. All, except that containing the estimated amount of sodium chloride needed, should be administered in the form of 5 or 10% glucose solution intravenously. Darrow advises against the subcutaneous use of isotonic dextrose (5.5%) solu-

tion as it immobilizes fluid at the site of the injection and is often very painful.

Traumatic Shock

MOON defines shock as "a circulatory deficiency, not cardiac or vasomotor in origin, characterized by a decrease in the volume of the blood, reduced cardiac output (volume flow of blood) and hemoconcentration."

It should be remembered that the main purposes and the vital functions of the circulation are carried out in the capillary bed, the heart, arteries and veins being merely a propelling and conducting system for the blood cells and plasma. The capillary bed is very extensive, in fact, so extensive that if all of these little vessels were opened at one time, the capillaries alone could accommodate the entire blood volume. The circulatory apparatus is so regulated that only certain portions of this very extensive capillary system are filled at any one given time. This capillary activity is brought about by a demand made by the tissue cells in the immediate vicinity of the capillaries in question. As the need for more effective circulation arises, the tissue cells secrete a substance ("H" substance) which acts on the capillaries situated locally and brings about the dilatation and an increased permeability of these little vessels.

The ability of the capillaries to constrict or dilate in response to the demands of the tissue cells, regardless of the state of tone of the arterioles, has been definitely proved. Under normal conditions the capillary walls are readily pervious to water, electrolytes and crystaloids, but not to the plasma proteins. Under the influence of the "H" substance the increase in permeability applies to the plasma protein as well as the other constituents of the blood plasma and is proportionate to the amount of the H substance present.

With these facts in mind the mechanism of traumatic shock can be readily understood. The trauma to the tissue cells brings about the production of an excess of the H substance. There develops in the vicinity of the trauma a marked exudation and transudation of the body fluids, electrolytes and plasma proteins, bringing about a decrease in the blood volume. This is followed by a constriction of the peripheral arterioles in the attempt to maintain an adequate circulation to the brain and vital organs.

As the process continues, the H substance, which is being produced in such excessive quantities, gains access into the general circulation and begins to act upon the capillaries in all portions of the body. As a result of the action of the H substance on the capillaries everywhere in the body, there is produced a dilatation of these vessels with the marked increase in permeability of their walls. This widespread profuse loss of the intravascular fluid brings about the further decrease in blood volume with more marked hemoconcentration.

Another factor which adds itself to the picture at this phase of the process is cell anoxia which is produced as a result of the capillary stasis and increased concentration of the blood. The tissue anoxia can of itself initiate the production of the H substance. Under the circumstances being described, it brings about the widespread production of this substance which, in turn, produces greater dilatation of the capillaries, more marked permeability of the vessel walls, and the loss of more of the blood volume. In this way a vicious circle is initiated, with the establishment of irreversible shock. In the meantime the peripheral arteriolar constriction fails to compensate for the increasing loss of blood volume, the vital centers suffer from anoxia, the circulation fails completely, and death follows.

The first stage of the circulatory failure or shock may be recovered from with the early institution of adequate treatment. However, if severe shock is allowed to progress over several hours, inadequately or improperly treated, irreparable damage to the cell structure occurs and no treatment can be effective. It should be emphasized that, in addition to the water and salt loss, there is a marked dissipation of the plasma protein from the general circulation, first into the injured tissues, and then into the tissues of the body generally. It is this loss of blood volume which ultimately brings about the circulatory failure and death of the patient. Hemoconcentration is an associated phenomenon which is one of the first signs by which shock may be diagnosed.

The requirement which must be met in treatment, therefore, is the supply of not only an adequate quantity of electrolytes and water, but the immediate administration of sufficient whole blood, or, better still, blood plasma to maintain an adequate circulation in order to prevent the loss of blood volume with the subsequent anoxaemia, circulatory failure, and death. The quantity of plasma protein necessary to accomplish this is enormous in some cases, but the requirement must be promptly met or else the patient can not survive. The transfusion of a pint of blood or plasma at intervals in severe shock might just as well be omitted. It must be remembered that the quantity of plasma needed is the amount necessary to restore and maintain an adequate circulation. It must be remembered, too, that 10% glucose solution and saline may bring about a slight temporary reaction from shock, but the reaction can only be maintained by the administration of whole blood or plasma.

Hemorrhagic Shock

IN THOSE instances of hemorrhage in which there is sufficient loss of blood cells and plasma to affect the individual, a condition comparable to traumatic shock occurs. The main difference between the two conditions, as described by Moon, lies in the manner in which the initial decrease in blood volume occurs. After the mechanism of hemorrhagic shock is set into action by the loss of blood, there is the same peripheral arteriolar constriction which occurs in an effort to maintain the circulation to the vital centers. If the blood loss

is not too great this factor compensates for the diminished blood volume. However, if this is not so, the tissue cells begin to suffer from anoxia with the subsequent production of the H substance. As in traumatic shock, in response to the excessive quantity of the H substance in the circulation, the capillaries become dilated, their walls become permeable to the plasma protein, a greater loss of blood volume occurs, and the patient dies in shock which was initiated by hemorrhage. Grave shock from this cause is fatal because of the irreversible mechanism which is set up as the process progresses toward the more serious state.

The treatment of hemorrhagic shock is obviously the reintroduction into the patient's vessels of a sufficient quantity of blood to maintain an adequate circulation in the peripheral structures. However, if the loss of blood has been great, the restoration of the blood volume must be made promptly in order to prevent the development of the irreversible features which are certain to develop in the neglected or inadequately treated cases. Blood plasma, normal saline, or glucose solution may be used only as supplements to whole blood in the graver cases of hemorrhage, inasmuch as the hemoconcentration plays no significant role in this type of shock.

Summary

THE maintenance of fluid balance in the body is a very important phase of physiology. Disturbances in the normal balance of this fluid result in several disorders.

1. Dehydration results from the loss of electrolytes from the body. Its development in medical and surgical cases should be anticipated and such measures taken as are necessary to prevent the development of the condition.

2. Edema occurs most often from the retention of sodium in the body, as a result of cardiac decompensation and from hypoproteinaemia. The treatment of these types of edema is briefly stated.

3. The cause and production of acidosis and alkalosis are discussed. The point is emphasized that many cases of acidosis and alkalosis are simply manifestations of electrolyte imbalance. The method of treatment is described.

4. The definition of shock is given and the basis for its production is discussed. Irreversible shock is explained. The necessity for early and adequate treatment of shock is emphasized. The fact that large quantities of plasma are imperative in the effective treatment of shock is brought to the attention of the reader.

5. The mechanism of shock from hemorrhage differs only from traumatic shock in the manner of the original blood loss, the rest of the process being identical. The early treatment by the transfusion of a sufficient quantity of whole blood is recommended.

References:

1. McLeod, J. J. R.: Physiology in Modern Medicine. C. V. Mosby, St. Louis, Mo., 1935.

2. Best, C. H., and Taylor, N. B.: The Physiological Basis of Medical Practice, Williams and Wilkins Co., Baltimore, Md., 1939.

3. Coller, Frederick A., and Maddock, Walter G.: Water and Electrolyte Balance, *Surg., Gynec. & Obst.*, February 15, 1940, Vol. 70, 340-354.

4. Darrow, D. C.: The Treatment of Dehydration, Acidosis, and Alkalosis, *J.A.M.A.*, Vol. 114, No. 8, February 24, 1940.

5. Newburgh, L. H.: Round Table Discussion: Metabolic Disorders, A.C.P. Post Graduate Course, University of Michigan, Ann Arbor, March 27, 1940.

6. Hartman, Alexis F.: Clinical Studies in Acidosis and Alkalosis; Use and Abuse of Alkali in States of Bicarbonate Deficiency Due to Renal Acidosis and Sulfanilamide Alkalosis, *Ann. Int. Med.*, Vol. 13, No. 6, December, 1939.

7. Moon, Virgil H.: Shock and Related Capillary Phenomena, Oxford University Press, New York, Inc., 1938.

X-Ray in the Treatment of Acute Osteomyelitis of the Fingers

—Preliminary Report—

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and
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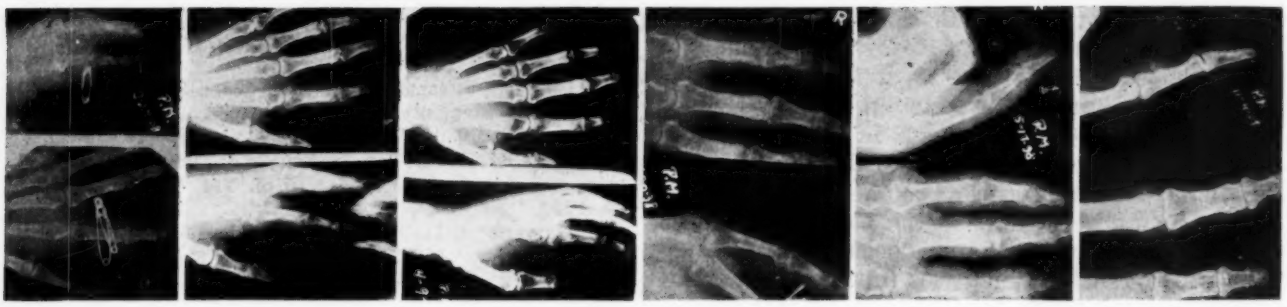
ACUTE osteomyelitis of the phalanges is a condition which frequently develops from injuries to the soft tissues. The original injury may be only a scratch, but extension into the bone frequently occurs. The course of treatment indicated is often inadequate, and the problem then arises as to what method to follow. Incision and drainage, curettage, moist heat and chemical solutions do not always bring about the desired results.

Kanavel[1] states that "In the great majority of cases considerable destruction of the proximal end of the middle phalanx will have taken place when the case comes to operation, and the question arises whether an amputation should be advised. Certain sociological factors come into consideration. If the patient is a laboring man with a family dependent upon him and at the time of examination we find an extensive destruction of the joint with a tenosynovitis, amputation offers the quickest method of giving a serviceable hand. If, however, the patient desires to preserve the finger, it can be saved with probably some shortening and no function except at the metacarpal-phalangeal joint." Christopher[2] also emphasizes the chronicity of this condition.

It naturally follows that in those cases which fail to respond after many weeks of treatment one must search for some therapeutic agent off the beaten path—a form of treatment which will not only prevent the spread of infection from the soft tissues to the bone, but will also, in cases seen late, arrest further destruction of the bone. We be-

From the Departments of Roentgenology and Casualty Surgery, Lutheran Hospital. Read before the Industrial and Orthopedic Section of The Cleveland Academy of Medicine, December 20, 1939.



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CASE 1.

lieve we have the answer in the form of deep x-ray therapy.

Dyes,[3] in 1933, satisfactorily summarized the underlying factors in the treatment of inflammation by x-ray. He gives sufficient proof that blood has active bacteriocidal properties after x-irradiation. He believes with others that small doses do not have any bacteriocidal effect themselves, but act through their effect on the reticulo-endothelial system. There is an actual increase in mobilization of defensive substances locally in the treated area. Some of these defensive forces have been thought to be due to increased activity of the cells in producing antibodies. Holtzknecht[4] stressed the importance of early treatment by irradiation and argued for the cooperation of roentgenotherapy with surgery. This principle applies just as effectually in the treatment of acute osteomyelitis as in the earlier cases of soft tissue infection. Allen[5] gives an extensive report on various types of infection treated by x-rays, all with good results. However, we failed to note mention of any case of osteomyelitis of the fingers.

When a case of bone infection involving the phalanges presents itself, the first principles of therapy call for the establishment of good drainage. There must also be constant, close observation by both roentgenologist and surgeon. Small, loose bone fragments are often seen in the wound, and these should be removed promptly. Only under such conditions do we think it wise to treat by means of x-ray.

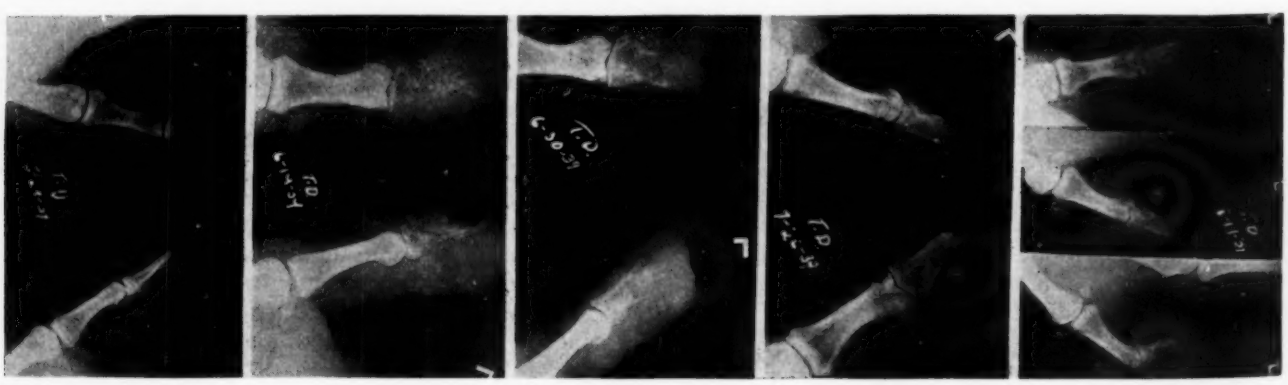
TREATMENTS are given in small doses ranging, in our series, from 100 to 150 R units measured in air with 200 KV peak, 8 milliamperes and 0.5 mm. cu filtration at 50 cm. target distance. This type of radiation is more intense than we generally use for a simple uncomplicated cellulitis. It is our belief that the higher intensity and change in quality of radiation are responsible for the uniformly good results which we have obtained in these cases of deep-seated infections.

Treatments are given on one or both sides of the affected finger, 100 R on each side, or 150 R on one side only. This should be repeated every two to three days until a total of 600 R to one field or 400 R to two fields have been delivered.

If the lesion is extensive when the patient is first seen, one should expect to see a sudden increase in the amount of drainage from the original wound. This, however, will gradually diminish. Sequestra should, of course, be removed. In those cases of minimal involvement, one or two treatments will usually suffice to stop the drainage in two or three days.

It is often difficult to determine how much of the increased translucency of these phalanges is actual trabecular and cortical destruction and how much is due to decalcification because of the infection and disease. Some of the radiability must be due to calcium loss since a radiograph taken directly after a course of treatment will always show an increased radiability. The remarkable regeneration of bone after treatment extending over four to eight weeks must be periosteal in nature. The periosteum is very likely spared by the infection and is stimulated by the treatment.

We very rarely treat the regional nodes, concentrating on the local infection. Treatment is indicated only when these nodes threaten to break down. The same small dose and intensity should suffice to abort the infection.



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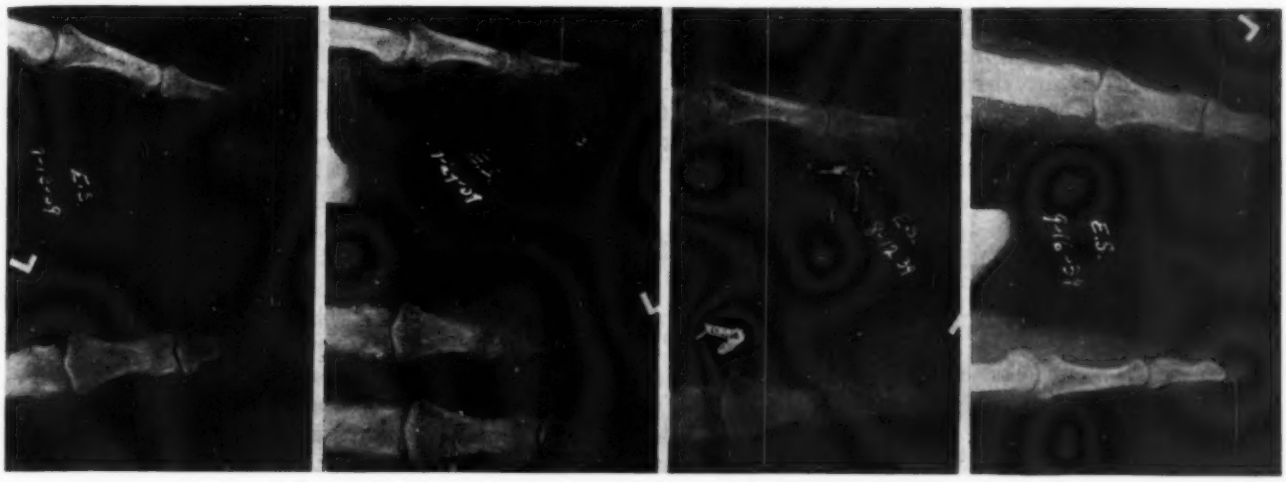
CASE 2.



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CASE 3.

Acute osteomyelitis of the phalanges, treated as above outlined, has given us most gratifying results. The following case reports illustrate our therapeutic routine:

CASE 1: P.M., a woman aged 44, sustained a minor scratch of her right index finger. Two days after the injury she presented herself for treatment, at which time the finger was infected, with a marked cellulitis extending into the palm. Her temperature at this time was 100.4°. The regular routine of hot compresses was instituted, but the infection continued to spread, culminating in her admission to the hospital the following day. For the next few days she was treated with permanganate soaks. On the fourth day incision and drainage along the lateral aspects of the finger was performed, a through-and-through drain being inserted. Soaks were continued. This apparently controlled the infection, and she was discharged 12 days after admission. Six days later she was readmitted. A second incision was made and a drain inserted. At this time x-ray therapy was instituted. She was given a total of 1050 R units and shortly after this treatment the infection was definitely checked. X-ray pictures showed recalcification of the bone. The flexor tendon, due to infection, sloughed out, but the patient obtained a satisfactory result. The total dosage of 1050 units was given over a period of three weeks.

CASE 2: T.D., a male, aged 35, sustained a severe blow to the tip of his left thumb. He treated himself, the condition becoming progressively worse. When he presented himself for treatment eight days later the injured finger was already infected. An x-ray at this time revealed no evidence of bony destruction. Incision and drainage was done four days later and an iodoform drain inserted. Hot soaks were advised. One month from the date of injury a second picture was taken, at which time a definite osteomyelitis was noted. X-ray therapy was begun the following day, a total of 1150 R units being given. The response was immediate, and x-rays taken a month later showed complete regeneration of the bone. The patient returned to work with practically 100% function restored.

CASE 3: E.S., male, ran a sliver of wood into the tip of his left index finger. This was promptly removed, but 10 days later the finger became swollen and painful. When first seen there was a cellulitis of the entire finger. Incision, drainage, and hot soaks were promptly ordered, but the response was unsatisfactory. Two weeks later an x-ray showed an early osteomyelitis at the tip of the terminal phalanx. X-ray therapy was started immediately, with a total dosage of 500 R units. Infection promptly subsided, there was a regeneration of bone, and a complete restoration of function.

CASE 4: A.T., male, had been treated five weeks before coming to my office and I do not know what was done for him. When first seen by me the finger was markedly swollen and examination showed a complete dysarthrosis of the terminal inter-phalangeal joint. The circulation in the entire finger was so badly impaired that amputation was indicated. However, conservative treatment was decided upon and patient was immediately sent to Lutheran Hospital where an x-ray was taken and x-ray therapy started. Almost instantly there was

10-16-39 10-16-39 10-30-39 11-15-39 11-28-39 12-14-39 1-24-40

CASE 4.

a return of circulation, the finger began to drain, and took on a lively appearance. Six days after treatment was begun there was a fluctuating area which I incised. This patient received 1200 R units of x-ray. The patient returned to work November 13, 1939, four weeks after my first examination.

Comment

FROM the illustrative cases synopsized it will be noted that the response to x-ray treatment was relatively prompt. The usual type of treatment instituted for these finger infections is often inadequate, the condition progressing to chronicity with loss of function, and deformity. The question might be raised as to the length of time of treatment, i.e., was the healing of a spontaneous nature independent of the radiation therapy? To this argument we counter with the statement that the *rapid response* following x-ray treatment is such as to reasonably suggest its marked healing effects. Although our series of 10 cases to date is obviously too small to draw conclusions from, our results justify, we believe, further trial of this type of treatment. From the standpoint of prophylaxis x-ray therapy is especially indicated. Early treatment of infected fingers will often prevent a complicated osteomyelitis.

Summary

A PRELIMINARY report on 10 cases of infection and osteomyelitis of the phalanges treated with x-ray therapy is submitted.

The results seem to indicate that this form of treatment is especially effective in preventing and curing this condition, with the restoration of good function and a minimum of deformity.

Bibliography:

1. KANAVEL, ALLEN B.: Infections of the Hand; Lea and Febiger, 1939.

2. CHRISTOPHER, FREDERICK: Minor Surgery, W. B. Saunders, Philadelphia.

3. DYES, OTTO: Grundlagen der Behandlung Entzuendlicher Krankheiten durch Roentgenbestrahlung. *Strahlen Therapie*, 1933, 47:160.

4. HOLZKNECHT, GUIDO: Roentgen Treatment of Spontaneous Post-traumatic and Postoperative Coccus Infections and Suppurations. *Am. J. Roent. & Rad. Therap.*, April, 1926, 15:332-336.

5. ALLEN, J. L., *Internat. Abst. Surg.*, October, 1938.

Morphine-Scopolamine Anesthesia

—*in First Aid Treatment of the Injured*—

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THE use of morphine-scopolamine anesthesia has been described since 1904. It was popular in obstetric practice and was commonly referred to as "twilight sleep."

In 1918 the use of this anesthesia was introduced at the Washington Boulevard Hospital by Dr. B. F. Lounsbury, former Chief Surgeon of the Milwaukee Railroad. It was found to be very satisfactory and was supplemented by nitrous oxide or ether when necessary; and it was used in almost all major and minor surgery including the emergency room in handling those traumatic cases which required general anesthesia.

Its use has been continued up to the present time and covers approximately 16,000 cases.[1]

In this paper we shall enumerate the advantages of using morphine-scopolamine anesthesia in the first aid treatment of the injured.

The pharmacological and toxicological actions of morphine and scopolamine (or hyoscin) as individual drugs are well known and need not be reviewed. When the drugs are used in combination there is produced a synergestic action the result of which induces a deep sleep and relieves pain. Van Hoosen[2] first pointed out that many of the undesirable side-effects of each drug were in direct antagonism to each other so that the desirable anesthetic effect was obtained.

Morphine-scopolamine when used in combination produces an anesthesia which:

1. Inhibits mental, sensory and motor function.
2. Allows a margin of safety with a minimum of interference with such vital functions as circulation and respiration.
3. Allows a degree of depth of anesthesia compatible with the amount of surgical treatment required which is especially valuable in first aid work.
4. Eliminates undesirable features such as excitment and post-anesthetic reactions.
5. Is satisfactory to the patient. By this we mean that the patients desire an anesthesia in which they lose consciousness with the least discomfort and keep no memory of what was done for them.

Without reviewing our experience in the use of this anesthesia in major surgery we will describe the technique of its administration.

MORPHINE-SCOPOLAMINE has been given to patients of both sexes, and from the age of 12 years up. In the first aid room we are using it in treating those cases requiring an anesthetic such as (1) fractures, (2) dislocations, (3) wounds requiring special care, and (4) burns.

When any person with such injuries is brought to the first aid room a careful examination is made to determine the extent of injury, identification for the record which is to be kept is made, and if the patient's general condition requires immediate treatment a hypodermic injection of morphine-scopolamine is given. The usual initial injection consists of morphine sulphate grs. ¼, and scopolamine hydrobromide grs. 1/50. In only the extremely young or aged is the dose smaller and then the dose is decreased to morphine grs. 1/6 and scopolamine grs. 1/100. During the subsequent 30 to 40 minutes the patient is observed closely and if time is an important factor, treatment is started using nitrous oxide and oxygen or ether or both. If, as in the case of fractures requiring much manipu-

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lation, a deeper and more prolonged anesthesia is desired a second and third dose of morphine-scopolamine is given, the size of the dose depending on the condition, age, sex and weight of the individual.

In our experience most working men between the ages of 18 to 60 and weighing 150 to 200 pounds will require two injections of morphine grs. ¼ and scopolamine grs. 1/50 and a third of grs. 1/6 and grs. 1/100 respectively. Some men tolerate three large injections. Most women from 18 to 60 and weighing 120 to 150 pounds require one injection of morphine grs. ¼ and scopolamine grs. 1/50 and two injections of grs. 1/6 and grs. 1/100 respectively of each drug. Larger women require the same amounts as an average man.

The injections are given 30 to 40 minutes apart and the patient is observed constantly during this time, a close watch being maintained on the pulse rate and the respiratory rate. The former is seldom affected, but there is usually a decreased respiratory rate and if it is down to 10 to 12 per minute no additional morphine-scopolamine is given. During the administration of this anesthesia the eyes are kept covered, the ears are closed with cotton and the room is kept quiet and darkened to exclude any disturbances that might retard the narcosis. Frequently in younger people and in the older people, one injection of the smaller dosage is all that is required to carry on the necessary first aid treatment.

In most cases no additional anesthetic is required, and the patient remains sufficiently narcotized for three to six hours to enable the surgeon to carry out the necessary procedures.

FRACTURES AND DISLOCATIONS: The practical use of this anesthetic in our first aid work is outstanding in the treatment of fractures requiring manipulation, such as fractures of the femur, humerus, both bone fractures of either the upper or lower extremity, and fractures involving the small bones of the hand or foot.

As soon as the diagnosis is made and the treatment to be followed is determined, the patient is given the initial injection of morphine-scopolamine and subsequent doses are given until the patient is sufficiently narcotized.

In the meantime needed equipment such as Balkan frame, fracture-bed, traction apparatus and splints are mobilized, so that by the time the patient is asleep, there is no delay.

The patient now can be handled so that he does not remember any manipulations and has no memory of pain although he may stir about or even moan when the injured member is moved. Gas (NO_2) or ether may be necessary if additional relaxation is desired. Manipulation is done in the bed or under the fluoroscope. The latter is especially desirable in the case of fractures of both bones of the leg, or fractures of the hands and feet.

If the fractures are compound the surrounding skin is thoroughly cleansed with soap and water, using a brush. The ends of bone if protruding are scrubbed, the margins of the wound are debrided if necessary. All fragments of clothing and dirt, and loose bone fragments which do not appear viable are carefully removed. In many instances where it is obvious that the ends of the fracture had protruded through the wound, before examination, the ends are again caused to protrude so as to permit them to be cleansed. The wound cavities after cleansing and debridement are irrigated with hychlorite solution, and then covered with sterile dressings, drainage being inserted if indicated in badly mangled wounds. The fracture is then treated as though it were a simple one.

The treatment of all open contaminated wounds should be according to the criteria set forth by Griswold,[3] viz, "To convert it into a clean closed wound."

We therefore agree with this author that the treatment of the wounds which occur in conjunction with compound fractures is fully as important as the care which is exercised in preventing infection in the wound of an ordinary hernia operation or any clean elective surgical wound.

WOUNDS: In the management of small superficial skin wounds general anesthetic may not be indicated, yet thorough cleansing of the so-called minor wound can often best be done under a general anesthetic, and in fact where exploration for injured tendons or nerves, or debridement, is indicated, especially where the injury is not over six to eight hours old, a general anesthetic becomes the procedure of choice.

In such wounds, when seen immediately and not over six to eight hours after occurrence, it is our practice to give the patient the routine injections of morphine-scopolamine, and while the patient is becoming narcotized the dressings to the injured part are kept saturated with warm hychlorite solution. When the patient is asleep, or often after the first and second injection with the addition of nitrous oxide gas, the procedures follow those recommended by Griswold:

1. The surrounding skin area is shaved and cleansed with green soap and water using an ordinary surgeon's "scrub-up" brush. Oil and greasy substances are removed with ether or gasoline (lead free). We do not choose to use any antiseptic solutions which stain the skin or tissues, but use either sterile saline solution or hychlorite solution to flush the wound and free the tissues of the soapy solution.
2. Debridement is done as indicated and all devitalized tissue and foreign particles are removed.
3. Injured nerves and tendons are repaired, and bleeding points are controlled.
4. The wound is irrigated again with a solution of soapy water followed by saline or hychlorite.
5. Split rubber tubes, rubber tissue or strands of silkworm gut are employed as drains.
6. The wound margains are not approximated but silkworm gut sutures are placed with the ends long, so that they may be tied later when it appears that infection has not developed.
7. While the patient is still asleep antitoxin may

be given and it is a matter of record that anaphylaxis seldom if ever occurs in a patient under general anesthesia.

8. The injured member is dressed so that it is put to rest as completely as possible and as stated in the case of compound fractures, splints or casts are applied as though the fracture were a simple one.

BURNS: It has become our custom more and more to consider all burns as serious enough to make thorough cleansing under a general anesthetic the procedure of choice.

These patients are given the first hypodermic of morphine-scopolamine as soon as possible, and no attempt is made to remove the clothing until they are narcotized. Prevention of shock in the severely burned individual is as important as the treatment of the burn itself.

When the patient is asleep the clothing is removed, all burned areas are cleansed with green soap and water and scrubbed with the brush if necessary. Large blebs are removed, and the cleansing procedure is continued until all the burned area has been taken care of. Previous applications of any oils or greases are removed with ether or gasoline.

The treatment advocated by Bettmann[4] consisting of the use of freshly prepared 5% tannic acid and 10% silver nitrate solution is then started and continued until the desired coagulum is formed. In our clinic we combine the two solutions either as a spray, or apply them with soft cotton pledgets. The portions of the dry tannic acid and $AgNO_3$ are already weighed and packaged in 5- and 10-gram sizes respectively, requiring only to be dissolved in sterile water for use. No dressings are applied. The patients are placed between sterile sheets in bed, with the upper sheet supported so as to form a tent, and external heat is furnished with electric light bulbs of not more than 15 watts, so as to reduce secretion and help keep the burned areas dry. As the coagulum loosens it is removed with clean scissors and forceps. The sterile linen is changed as frequently as necessary, and the usual supportive treatment is continued as long as necessary.

There are, no doubt, emergencies which arise which have not been discussed.

We wish to emphasize: 1. The value of morphine-scopolamine in the first aid treatment to the injured because of its (a) ease of administration, (b) versatility in meeting the need in all kinds of injuries, (c) safety of use, (a) induction of an anesthetic which relieves the patient of pain and memory of any painful procedures, (e) use which allows the surgeon to carry out the most thorough cleansing treatment of injuries especially severe burns and contaminated wounds, as well as the manipulation of fractures and dislocations, as soon as possible after the injury was received, which in turn lessens the incidence of infection and post-traumatic shock, and because it (f) allows a working time of three to six hours to accomplish this treatment.

References:

1. Reflections on use of Morphine-Scopolamine in 15,000 surgical cases, A. R. METZ, M.D., 1937.
2. VAN HOOSEN, BERTHA: Scopolamine-Morphine anesthesia, 1915.
3. GRISWOLD, R. ARNOLD: The Treatment of Recent Wounds, 1938.
4. BETTMAN, A. G.: The Rationale of the Tannic Acid-$AgNO_3$ Treatment of Burns, 1937.

Industrial Health

—Symposium under the Sponsorship of the Department of Preventive Medicine, Medical College of Virginia, Richmond, September 12-13, 1940—

Reported by

C. O. SAPPINGTON, M.D., DR. P.H.

ON Thursday and Friday, September 12 and 13, 1940, a symposium on industrial health was held under the sponsorship of the Department of Preventive Medicine, Medical College of Virginia, Richmond, in cooperation with the Department of Clinical Education, Medical Society of Virginia. The meetings were held in the Simon Baruch Auditorium in the Egyptian Building of the Medical College of Virginia.

There were five sessions, two during the day on Thursday and Friday, and a special evening session on Thursday for managers of industrial organizations. The program follows:

THURSDAY MORNING SESSION:

DR. HARVEY B. HAAG, Professor of Pharmacology, presiding.

"The Medical Society of Virginia's Program for Industrial Health"—DR. HUGH TROUT, President Medical Society of Virginia.

"The American Medical Association and Industrial Health"—DR. C. M. PETERSON, Secy. Council on Industrial Health, American Medical Association.

"Benzene in Industry"—DR. P. A. DAVIS, Akron, Ohio.

"Industrial Lead Poisoning"—DR. ROBERT A. KEHOE, Associate Professor of Physiology, University of Cincinnati, Ohio.

THURSDAY AFTERNOON SESSION:

"Adequate Nutrition for the Industrial Worker"—DR. LELA BOOHER, Chief, Foods and Nutrition Division, U. S. Dept. of Agriculture, Bureau of Home Economics.

"A Medical Set-up for a Small Industrial Plant"—DR. A. J. LANZA, Asst. Medical Director, Metropolitan Life Insurance Company.

"Instruments Used in Plant Surveys by the Bureau of Industrial Hygiene, Virginia State Department of Health"—MR. R. T. HOMEWOOD, Associate Industrial Hygiene Engineer and Mr. H. J. Worsham, Industrial Hygiene Chemist.

THURSDAY EVENING SESSION:

DR. W. T. SANGER, President, Medical College of Virginia, presiding.

"Do Good Working Conditions Pay?"—DR. VICTOR G. HEISER, Committee on Healthful Working Conditions, National Association of Manufacturers.

"Development of Industrial Hygiene in State and Local Health Departments"—MR. J. J. BLOOMFIELD, Sanitary Engineer, U. S. Public Health Service.

"An Industrialist Looks at Employee Health"—MR. L. B. F. RAYCROFT, Electric Storage Battery Company, Philadelphia.

FRIDAY MORNING SESSION:

DR. PORTER VINSON, Professor of Bronchoscopy, presiding.

"Peripheral Vascular Disease in Industry"—DR. BAYARD HORTON, Mayo Clinic, Rochester, Minnesota.

"Cardiac Diseases in Industry"—DR. W. B. PORTER, Professor of Medicine, Medical College of Virginia.

"The Control of Tuberculosis in Industry; A Responsibility and a Profit"—DR. C. D. SELBY, Medical Consultant, General Motors Corporation.

FRIDAY AFTERNOON SESSION:

"Objectives of Health Examinations and Their Industrial Applications"—DR. G. H. GEHRMANN, Medical Director, E. I. du Pont de Nemours & Company.

"The Private Practitioner and Industrial Health Examinations"—DR. RAYMOND HUSSEY, Associate Professor of Medicine, University of Maryland.

"Physical Examinations in Employment from the Legal Viewpoint"—MR. THEODORE C. WATERS, of Mullikin, Stockbridge & Waters, Baltimore.

Thursday Morning

DR. HUGH TROUT, speaking on the subject of "The Medical Society of Virginia's Program for Industrial Health," stated that about three years ago a statewide survey was made of various industrial groups, it being discovered that only 15% had full time surgeons. It is therefore a problem for the medical societies to educate the other 85% of the industrial groups. Numerous and increasing calls have been made on the State Health Department for industrial health information—which is a good sign. Community health problem of setting up large industrial facilities has now become a reality. (Reference was made in this respect to the Hercules Powder plant which is to employ from three to five thousand workers.)

The problem of the medical profession at the present time is to meet the national emergency. We therefore look forward with a great deal of anticipation to the forthcoming meeting in Chicago where army, navy and public health service representatives will meet with the American Medical Association to coordinate activities, and to avoid the confusion previously experienced.

DR. C. M. PETERSON, speaking on "The American Medical Association and Industrial Health," stated that the A.M.A. had for some years past a number of agencies which interested themselves in industrial health problems, particularly with respect to medical economics, public relations and social legislation. An investigation of workmen's compensation was made in 1915. The Section on Preventive Medicine appointed a committee on sanitation which report included all items which are now recognized as being important. A great deal of increase in space allotted in the publications has been devoted to material relating to industrial health, including queries and special articles. Studies in rehabilitation and air-conditioning, in ventilation, have been made, the reports having been given to the medical profession through the usual channels.

Therefore, it seemed natural that a Council on Industrial Health be established and that early relationships should be made with state and county societies in the form of committees for organization of these groups. It seemed natural to use the organization structure of organized medicine in this way. The activities have taken the form of investigations, correlation and education.

Investigation in this instance is not primarily research, but rather the acquisition of relationships with various groups. The value of health maintenance in small groups through the use of private practitioners is an important principle. Also the correlation of lay group activities in this field is of especial moment.

The physician must be guided along the lines of what he can do in industrial health work. This is most significant now because of the lack of trained personnel for defense purposes. There has been a lack of opportunity for education during and after medical training; so the problem is proper and adequate courses, for which there is now a syllabus in preparation. Finally, we are looking forward to medical responsibility being properly represented in industrial health work.

DR. P. A. DAVIS spoke on the subject "Benzene in Industry."

Benzene, or benzol as it is also called, is derived from the distillation of coal tar and as such, contains six atoms of carbon and six atoms of hydrogen as compared with benzine which contains 16 atoms of carbon and 14 atoms of hydrogen.

Several grades are used, the so-called 95%, the 90% grade, and the so-called 50% grade. The uses were described briefly, such as solvents, leather manufacturing, rubber manufacturing, cleaning, and as fuel.

Three avenues of entrance to the human body were mentioned, the most important being the respiratory route.

In discussing symptoms, the following were mentioned: brackish taste, giddiness, nausea and vomiting, weakness, odor on breath; gingivitis, arthritis and gastritis, nervousness, bleeding gums and uterus, tremor of hands, loss of equilibrium in the dark, loss of weight, pallor, dermatitis, nephritis, coma. The anemia is an important guidepost for the physician; there is usually a leucocytosis at first which is followed by a leucopenia, accompanied by a decrease in coagulation time, and antibody formation. New blood forms appear and finally disappear. The condition must be differentiated from myologenous leukemia.

Since 1935, the urinary sulphate test has been used to very good advantage. The following hints are given with respect to the use of this test:

1. In most industries, benzene is used where there is a fire hazard and therefore is mixed with other hydrocarbons, which affect the validity of the test.
2. Check all persons under a 70 ratio.
3. It has been found that there is no change in the blood when there is exposure to 75 to 100 parts per million in the air.
4. Alcohol causes definite changes in the test.
5. Fluctuations from 50 to 80 in persons with blood otherwise normal will occur.
6. If the test shows 50 or less, remove the individual from his exposure, or lower the concentration of the exposure.

With respect to prevention and control, the following items were discussed:

1. Since the vapors are heavier than air, there should be suction near the floor.
2. No persons with cardiac or blood ailments should be accepted, nor women if it can be helped.
3. Alcoholics tolerate the exposure much better than others.
4. There should be proper instruction in handling of the material and with respect to an appreciation of the hazard.
5. Frequent examinations should be conducted, from 30 to 70 days' intervals, according to the concentration in the air. Those found to have blood deficiencies, disturbances of equilibrium, and heart trouble, should be transferred to other occupations.

The substitution of other substances has been found to be a difficult problem. Toluol, xylol and hi-flash naphtha cannot be lightly considered. Gasoline works well and reduces the distasteful symptoms.

There must be close cooperation between the various departments to arrive at a solution of the problem, which concerns itself with determining whether there is a harmful concentration as used; the use of a substitute; or the use of a substance which may be harmful, together with proper ventilation; and the use of protective equipment when necessary.

The treatment for benzol poisoning was outlined briefly.

In conclusion, it was stated that benzol in industry presents a definite hazard of acute and chronic disease; control is possible through properly adjusted ventilation, the substitution of less toxic or nontoxic substances; frequent examination and removal when necessary; education; cooperation between the production and medical departments; the establishment of standards for workers; the estimation of benzol concentrations at important points in factory; through a combination of such methods, benzol can be used and properly controlled.

DR. ROBERT A. KEHOE spoke on the subject "Industrial Lead Poisoning."

It is necessary to understand the difference between safe and unsafe conditions; it is likewise vital to know that there are levels of physiological exposure, higher levels which are not dangerous, and also dangerous high levels.

We must be able to detect the first signs of injurious effects and it is important in this respect that we have a good understanding of the behavior of lead in the body.

Lantern slides were used to good effect to show various statistical tables important to the consideration of the various phases of the subject. Occupational distribution of lead poisoning in 1935 was considered and it was shown that fatal cases are diminishing considerably, but compensation cases not in the same proportion.

In diagnosis, the patient's story is usually of little value and often misleading unless the individual facts are known. Dependency must therefore be placed very largely in medical evidence.

Stippled erythrocytes (the development of youthful forms) average 400 per million in normal persons, the range of variation being 2 to 1000 (80 is the factor for converting the number of stippled erythrocytes from the standard of 50 fields to standard per million). Stippling does not of itself indicate absorption as experiences have shown with respect to the administration of oral lead compounds as compared with normal findings in normal individuals. Experiments have furthermore shown that the amount of lead in the daily food corresponds closely to the fecal output of lead.

In individuals in 10 scattered cities, there was 0.398 milligrams per fecal sample, which corresponded to previously controlled observations in laboratory subjects.

For comparison, there were two individuals in the lead industry, fecal content showing the mean of 0.457 in one and 0.619 in the other; of course, there was no lead poisoning in these plants.

Under the worst conditions, however, it has been found that from 2 to 21 milligrams daily are released in the fecal output.

A great deal has been said about the lead line at the epiphyseal end of the long bones in children; this can be definitely demonstrated in x-ray films but is not feasible for diagnostic purposes in adults.

The urine output of lead in normal subjects shows a mean upper limit of 0.02 to 0.03 milligrams per liter and this is true in other countries, as well as in the United States. In small samples, anything below 0.1 milligram per liter is regarded as normal.

For comparison, in an industrial group that showed no poisoning, there was a variation from 0.037 to 0.079, whereas in groups near the threshold of toxicity (but without anything but slight symptomatic effects), the mean was 0.97 milligram per liter and the air exposure in this instance was 1.5 to 2 milligrams per 10 cubic meters of air.

In considering the blood lead content, the lead being practically all in the cells, 0.027 to 0.024 milligrams per 100 grams of whole blood were normal figures—up to 0.004 is considered normal findings.

The urine, as such, has been shown to be a more sensitive base for the estimation of lead content than the blood, but large samples must be taken.

There is a marked difference in tissue content between normal and abnormal persons.

In extensive experiments on feeding lead to normal subjects—in one instance one milligram and in the other, two milligrams per day, which observations are still going on—it is of interest to study the onset of poisoning as differentiated from the normal metabolism of lead. The subjects retain about 5% of the lead and excrete about 95%, mostly by way of the fecal route, which is probably without absorption.

The experiments lead us to believe that lead apparently is not stored in inert form.

Experiences with milk, apple powder and vitamin C have revealed no change thus far in excretion, but experiments will be repeated in other groups.

Regarding symptomatology, there are three general sets of symptoms:

1. The gastro-intestinal symptoms are usually first and most numerous and become more severe, beginning with anorexia at breakfast, discomfort, slowing of gastro-intestinal muscular activity, first amounting to constipation and later to obstipation, and with increasing constipation with the increase in absorption and evidence of intoxication.

2. Neuromuscular symptoms which are represented particularly by sensitivity to stimuli (autonomic), dysfunction and absence of function; cramps; weakness; paralysis (polyneuritis and paralysis). In the adult, the upper extremities are particularly affected and not infrequently the lower extremities are involved in children. The characteristic finding is a classical musculospiral paralysis.

3. Encephalopathy is rare but not nonexistent and is usually evidence of gross exposure. It must be differentiated from organic lead poisoning, of which there is very little at the present time and therefore there should be no difficulty in this respect. The patients are nonreactive and somnolent with tendency to go into coma and die. The prognosis is usually bad. In closing, it is well to state that practically all cases of lead poisoning without neuromuscular or encephalopathy aspects get well without specific therapy.

Thursday Afternoon

DR. LELA BOOHER in introducing the subject "Adequate Nutrition for the Industrial Worker," stated that this is a highly industrialized country and that scientific nutrition is an established fact. However, there are still many applications which have been left undone. The most logical point of attack is nutritional education for the worker and his family. However, research needs to be continued further.

Industrial workers form a heterogenous group which makes the problem more complicated because of the fact that one cannot discuss requirements in the aggregate. It has been stated that the average daily need for men is 2400 calories as compared to 3000 in industry; whereas the average daily need for women is 1800 calories as compared with 2400 for women in industry. A good method is to add 75 calories per hour for the usual industrial worker; for light work, 75 to 150 calories are added; for moderate work, 150 to 300 calories, and for heavy work 300 calories and over.

It has been fairly well accepted that neither hunger nor satiety is conducive to the best work. However, Haggard and Greenberg reported an increase in muscular energy after meals and also associated with the absorption of sugar. The general opinion is that a smaller and greater number of meals provide a better baseline of energy.

On the whole, plant proteins are less effective than animal proteins—for the average adult about equal amounts are considered adequate. Formerly 70 grams of proteins daily was the usually accepted amount, but now 100 to 120 grams are recommended.

A balance of about one-third protein, one-eighth fat and the rest carbohydrates is now the accepted spread of energy units in the daily diet. Calcium, phosphorus, iodine and iron need special attention. Milk is probably the best source of calcium and phosphorus and one pint daily is recommended as the minimum. Iron should be taken in the amount of 10 to 15 milligrams daily in the form of eggs, lean meat, leafy vegetables, green beans and peas. Iodine is required in the amount of 0.045 milligram daily, of which seafoods are a good source. Sodium chloride, or common salt, should average 10 to 20 grams daily and is depleted considerably by working in high temperatures. A 0.1% solution of sodium chloride has been found effective in drinking water under such depleting conditions, or 15 grams have been added to the diet daily.

The subject of vitamins is one to which the public has responded in a fabulous manner, in respect to advertising. There is no known substitute for a well diversified diet as to protective influences. The difficulty is that requirements are not well founded on adequate criteria. However, allowances with a margin of safety are as follows: vitamin A—5000 to 6000 units daily; thiamin 1 to 2 milligrams daily; ascorbic acid 60 to 70 milligrams daily; for vitamin D and other vitamins no reliable estimates have been made.

The adaptation of diet to individual employees is a real problem and in illustrating this, the essayist showed tables on lantern slides taken from the Year Book of Agriculture for 1939, for a family of four different individuals for a period of one week. The calories thus provided were illustrated and the weekly cost for a family of four would vary from $6.00 to $9.50 in one instance.

In conclusion, it should be stated that a combination of education in economic factors is necessary for a successful outcome and the provision of adequate nutrition without undue expense is the real problem presented.

DR. A. J. LANZA discussed the subject, "A Medical Set-Up for a Small Industrial Plant."

There has been a considerable tendency to overlook the small industrial groups, because of the habit of using large figures. The majority of employees are in small plants, 80% being in groups of less than 100 and 97% being employed in groups of less than 250.

The aggregate waste of manpower in industry is enormous, but it is not appreciated because it occurs in driblets. There has been much interest and talking, but now something is being done and use is being made of the bedrock of educational facilities.

Compensation for sickness arising out of in-industrial groups, having been made statutory, has stimulated preventive as well as curative aspects of this problem.

A number of organizations have interested themselves, namely the National Association of Manufacturers' Commitee on Healthful Working

Conditions; the A. M. A. Council on Industrial Health with the formation of state committees; the United States Public Health Service Industrial Hygiene units being established in the various states; and the Air Hygiene Foundation of Pittsburgh, which provides material relative to the problems occurring and the control of them.

The National Defense Program is now emphasizing protection as being the basic need.

Dr. W. J. McConnell some 15 years ago started work in Philadelphia through the Philadelphia Health Council, which established a consulting service for small groups under 500 employees. A nurse was provided for each unit and a physician for each of two units, with an average cost of $4.50 per employee per year. The original idea was to turn over the units after having them established, to the various industries which would run them for themselves. Later the service was separated and turned over to Dr. Glenn Evarts. The plan worked very well at that time, but it would probably work better at the present time.

There are two main plans which are now being used: (1) A physician is located near a number of plants and is retained on call; use is made of a nurse or first aid person in the plant; employees are sent to the physician's office for examination or for treatment. (It has been agreed that it has been much better for the physician to call at the plant than to stay at his office.) (2) Groups of physicians have been organized, being located adjacent to industrial organizations. This permits of specialization within the groups of physicians. This plan has been carried out very largely in the larger communities.

Another plan which has met with no great success is a combination of several industries for service under one physician.

Etiology is most important in this work. A physician need not be a toxicologist or a chemist, but he should have an understanding of things that occur in the working day which affect the workman's health. Educational measures are also important.

It must be realized that the employee spends only 40 hours exposed to the environment of work out of a total period of 168 hours per week.

A middle course must be steered in order to get at the real facts. One must not be prone to call everything industrial as to cause, but must not overlook industrial causes. Etiological studies are the real key.

As an illustration of what has occurred, it was found in one plant that the absences due to gastro-intestinal disturbances were three times those caused by respiratory disturbances. Investigation showed the plant to be in fairly good condition. However, it was several years until one of the workers went to a large city and was diagnosed as a case of lead poisoning.

The difference between the small plant and the large one is only in quantity and not quality. The equipment used should be simple in the small plant and the cases should be referred to the proper specialists.

The duties of the nurse and the first aid man should be put in writing and posted in conspicuous places; such duties should be well understood by these persons, as well as by the management.

Records are vital—every transaction should be recorded. One reason why executives do not really appreciate the importance of the health problem in industry is because they don't receive periodic reports which would acquaint them with conditions as they are. Non-occupational sicknesses and accidents should be reported, as well as occupational sicknesses, and a great deal of emphasis is now being put on nonoccupational sickness. The more simple the records can be made, the more efficacious will they be.

There has been considerable tendency to greater specialization in industrial medicine, but the smaller plants will probably rely on the general practitioner for some time to come. Additional facilities are now provided through state commissions and units; it remains for those who are qualified to integrate the knowledge available, for industrial use.

MR. R. T. HOMEWOOD and MR. H. J. WORSHAM demonstrated "Instruments to be used in plant surveys by the Bureau of Industrial Hygiene of the Virginia State Department of Health."

The doctor and the chemist and the engineer must all cooperate and coordinate their activities in these problems.

Atmospheric conditions are usually first thought about and, therefore, attention is given to dusts, gases, vapors, fumes, and the ventilation of workplaces. There are other problems, however, which are important and must be considered.

A demonstration was given of the impinger dust collector and also the midget impinger; the Bausch & Lomb dust counter; the Mine Safety Appliances Company's electrostatic precipitator; the Mine Safety Appliances' carbon monoxide continuous indicator; fritted glass bubblers in series; the MSA hydrogen sulphide detector; the Willson chlorinated hydrocarbon sampler; the Friez psychrometer; the Willson air velocity apparatus; Vane anemometers; and the Weston illuminometer.

Attention was called to a bulletin which has been issued by the State Department of Health on the "Evaluation of the Industrial Hygiene Problem in Virginia." Detailed surveys have been made in the monument industry with respect to silicosis; carbon monoxide exposure in gas manufacturing plants; temperature and humidity studies in textile plants; at present a lead study is being conducted in the printing industry.

Thursday Evening Session

DR. VICTOR G. HEISER discussed the subject "Do Good Working Conditions Pay?"

The success of the German blitzkrieg has been due to mechanizing warfare through the building up of good industrial production and good industrial health. The nation has had a phenomenal health program and has pointed the way to the things we have to prepare in our own country.

Through the National Association of Manufacturers' survey, the importance of the following items have been emphasized: (1) preventive medicine; (2) care of the injured; (3) proper lighting; (4) proper heating and ventilation; (5) adequate sanitation; and (6) proper safety provisions.

About 50 million of our people are gainfully employed in industry and of these, eight million are in manufacturing groups; 80% however, are to be found in smaller groups. In the larger groups 80% have had reasonable health service, but 80% in the smaller groups have no real preventive or health service.

In a survey of lighting in 3000 factories, it was found that the lighting was poor in over 50% — however, this is being greatly improved.

Sanitation is merely decent living conditions in industry.

With respect to occupational diseases and prevention, the reduction in the danger of silicosis has been remarkable.

In the smaller groups, accidents are relatively higher and this shows us where the real problem is.

Industrialists by and large would not part with their medical services, although the expenses were cut down somewhat in the last depression; the curtailment however was proportional to other departments.

Objections to physical examinations are nonsensical and must be met by proper education.

Only 10% of absences are due to occupational causes, the other 90% being due to general diseases; it is therefore necessary to do more for these problems and a great deal can be done without infringing upon the rights of others.

Defense preparation is no longer a question but a reality. The industrial physician will play a vital part in the defense program.

In Europe during the recent war, the tuberculosis problem increased, but the diabetes problems decreased. It is believed that the German working people are well fed. The German diet experts have provided a simple diet costing 30c a day. Menu cards carry caloric values and show inexpensive combinations. Even the house lots have gardens for raising vegetables and the houses are purchased on government loans. Vacations are taken with pay and are provided at low rates of expense. Many gymnasia have been established and it can be said that the nation is almost "exercise crazy."

In this country we produce an abundance of foods, but need better methods of distribution. A comparison of exercise and food habits in this country with the people of Europe shows that our people are somewhat soft.

In conclusion, DR. HEISER quoted from Woodrow Wilson: "The greatest efficiency comes from the voluntary cooperation of a free people."

MR. J. J. BLOOMFIELD discussed "Development of Industrial Hygiene in State and Local Health Departments."

Industrial hygiene aims to improve the health of the gainfully employed population.

In approaching the nature and scope of the problem, it is evident that much has been done in safety; fatal accidents have been cut from 35,000 to 17,000 per year, but there are still many thousands of persons permanently disabled.

With respect to occupational diseases, there is not much of record; figures show that there are approximately 1200 cases a year in Ohio, 1500 in New York, and some 25,000 in California.

Data from state industrial hygiene surveys show that among 15 million persons gainfully employed the exposures occur to various substances in the following frequency: carbon monoxide; petroleum products; silica dust; lead and compounds; organic solvents; coal dust; alkali compounds; oils, fats and waxes; sulphur dioxide; alcohols.

With respect to physical examinations, industry ordinarily rejects 4 to 5% of the applicants, while the United States Army has rejected 25 to 30% of its applicants.

The Metropolitan Life Insurance Company figures with respect to occupational mortality were quoted and discussed. It is seen that unskilled and semi-skilled persons have higher rates in mortality and morbidity throughout than skilled and professional groups.

In claims for sick benefits, which the U. S. Public Health Service has been collecting for many years, the respiratory, digestive and external causes together aggregate about one-third of the total number of cases.

The usual comparison between time losses referable to accidents, occupational diseases, and ordinary diseases showed that the latter was the cause of most time lost. It was especially emphasized that ordinary illnesses must be attacked in order to meet this problem properly.

In tabulating the various types of services in different plants, it is clear that the largest plants have fairly good organizations. However, even in the larger plants only 14% have competent local exhaust systems to cope with silica dust exposure and there are other defects in engineering service.

The cost of medical service has been put at approximately $13.00 per employee per year in the small plants as compared to $8.00 per employee per year in the larger plants.

Various organizations were cited as to their programs, the 10-point program of the Council on Industrial Health of the A.M.A. as an example; the work of the Department of Labor and the Bureau of Mines and the U. S. Public Health Service also being mentioned.

Prior to 1936 only four states had industrial hygiene units, after which the Social Security Act allowed through the allocation of funds, some 36 of these, including cities and other types.

The function of the state industrial hygiene unit was outlined in detail and the principle of complete adult education programs was emphasized as a necessity.

We are now better prepared to handle industrial hygiene in national defense than ever be-

fore; the state and local health departments can actually do the work which will be asked of them. But we want to keep on utilizing such units after the national emergency has passed. In other words, the state and local health department units should be used as a part of a national permanent program.

Industrial hygiene is therefore here to stay.

MR. L. B. F. RAYCROFT presented the subject "An Industrialist Looks at Employee Health."

We have to be critical about figures of employees exposed to potential hazards, since all workers are not actually so exposed.

Management's point of view with respect to losses due to incapacity and absenteeism must be taken into consideration, and management itself must realize that these losses occur very largely from non-industrial causes.

Experiences of the speaker were detailed with respect to the silicosis work at Gauley Bridge, and with respect to sanitation on shipboard and in ports about 1893.

It is only in recent years that industrial medical men who have really done the finest work along health lines have been actually recognized by the medical profession.

Management is more and more making use of engineering and medical specialists in this field of work.

Comparing the expense of labor turnover with the expense of cleaning up an industrial plant has shown the rationality of the latter. The adoption of modern methods can be sold by proper and patient presentation.

It is everybody's job to guard against hysteria, emotionalism and such temperamental wastage. The industrial health movement must not become a "prohibition movement."

The real selling arguments for preventive medicine in industry are those which we are commonly using all the time among ourselves. Therefore, industrial relations and public relations become very important. Public opinion is greatly needed to support management's protective measures for employees.

This is the day of "built-in" facilities — your adopted scheme must be built in to accommodate itself to the machines, men and management of your organizations.

Remember that enthusiasm dies down if it is not done this way—successors to the present generation must carry on and need an adequate basis with which to work.

Friday Morning Session

DR. BAYARD HORTON in discussing the subject "Peripheral Vascular Disease in Industry," stated that there was but one vascular disease related directly to industry, that of pneumatic hammerer's disease.

It has been chiefly during the past decade that medical men have been conscious of peripheral vascular disease.

Mechanics are easy to understand — the vessel is a tube which contains blood—the functions of the vessel are to constrict and dilate; organic difficulty may be caused by occlusion, permanent dilatation or a condition of short-circuiting. It is obvious that the amount of pain and disturbance varies.

Colored lantern slides were used to show cases of Reynaud's disease which occurs in the hands and feet, mainly in women; in this we have red, white and blue discoloration but the condition never leads to gangrene. There are only skin and superficial changes. The disease can very easily be controlled by a temperature of 87° F. or above in the immediate environment. There is relief also from cutting the sympathetic nerves. The condition is often confused with thromboangiitis obliterans.

Arteriography has been very useful in the diagnostic study of these conditions.

The statistics of the clinic have shown that between 1907 and 1939 there were 1091 patients who registered 1593 times and out of this group, there were 230 amputations. It is felt, therefore, that there is considerable room for improvement in the treatment of these difficulties.

The geographical distribution of the cases by states shows that Illinois led with 122 cases and 43 amputations; Minnesota, 107 cases and 34 amputations; New York and Michigan each showed 45 cases and 20 amputations.

The amputation percentage can be reduced only by education in early recognition of functional disturbances and for living within limitations.

The story which is usually given is first difficulty in walking, accompanied by a discoloration of the feet sooner or later; when the feet are elevated they blanch; an important procedure is testing for pulsations in the arteries of the feet.

Slides of different stages of the disease were shown and explanations given.

There seems to be a definite relationship between smoking and the incidence of peripheral vascular disease. Whether this is or is not a direct relationship is not known at present.

The amputation percentage arises to 30% after three years; to 40% after five years; and to 60% after 10 years.

A thermo-couple apparatus for reading the temperature in toes and fingers was used in a great many observations at the clinic. It was found that the normal toe temperature in affected persons is lower than the room temperature. It was found also that there was a normal vasodilation following the administration of alcohol, the toes not being as much affected as the hands and the cheek.

An important principle in the treatment is to find out whether there is an abnormal temperature reaction; that is to say, when the temperature of the toes does not rise to room temperature until 87°F. and above has been reached in the room temperature. There is no use of operation if proper results can be gotten by adjusting room temperatures.

Humidity is not concerned in controlling the surface temperature, although it is a matter of comfort.

Experiments were carried out on so-called basal patients. With a temperature of 68° the toe and finger temperatures drop. It was found also that toe temperatures rise after food.

If the sympathetic nerve supply has been cut, the hand and feet temperatures are reversed in their reactions.

It is stated that after many experiments artificial pressure boots do not accomplish their purposes, but that covering with a blanket over a cradle really does accomplish the desired purpose raising the temperature of the toes.

Another type of apparatus has been known as the intermittent venous occlusion apparatus which really brings the temperature of the toes down or the temperature remains constant, rather than raising the temperature of the toes.

The tilting bed apparatus is probably the best, but must be used in conjunction with proper room temperature and food, the two latter factors really being responsible for favorable temperature changes.

A case history was given on a case of arteriovenous fistula. Closing the fistula by compression slowed the heart as shown by the graphs made and the size of the heart was decreased in the x-ray film.

X-ray film demonstrations were also made of short-circuit cases; in these instances, a simple tying-off operation relieves the difficulty.

Short-circuit cases are often confused with results of varicose veins.

In summary, it was stated that it is an important principle to identify and study circulatory disturbances. It is furthermore of vital importance to teach the patient how to keep out of trouble, by adjusting himself to external temperature.

DR. W. B. PORTER spoke on "Cardiac Diseases in Industry."

The problem is essentially one of selective assignment of the worker. The discussion given was based on this conception and the results described in persons with potential or actual heart disease.

The dynamics of the circulation show that the heart must carry the load alone when there is no exercise being done. When the patient is not fit, the pulse and respiration are accelerated but in training this is not true. The dynamics of the cardio-respiratory apparatus are relatively more efficient under exercise and training. It was stated that an increase in the size of the heart can be ignored in military and industrial subjects.

The cardiac cripple should be encouraged to do all he can without discomfort, as he will thus be more efficient in his cardio-respiratory functions.

With heart failure we must study—(1) the disproportion between the load and the coronary circulation; (2) progressive reduction of the coronary circulation; (3) myocarditis; (4) thyroid disease; (5) food deficiency (vitamin deficiency); and (6) obesity. These are the usual associated causes of heart failure.

There is a great opportunity in industrial organizations to study the effects of various occupations on the cardiac cycle and changes within such cycles.

There is an especial opportunity to make presymptomatic studies of minor changes to evaluate such presymptomatic conditions.

DR. C. D. SELBY, in discussing the subject "The Control of Tuberculosis in Industry—A Responsibility and a Profit," stated that pulmonary tuberculosis is a bacterial disease and is not peculiar to industry. Tuberculosis does not necessarily arise out of occupation. However, tuberculosis is important to industry because (1) it is a terminal infection in silicosis; (2) there is a tendency to assume that gases, vapors, fumes and ordinary dusts aggravate tuberculosis; (3) tuberculosis is more prevalent than occupational diseases.

Overall, the problem is one of the community concerns. Sound long-range programs provide for clearance of the plant and keeping the plant clear of tuberculous employees. There must be safe conditions of work and close medical supervision. The organization needed is no different here from that which has already been established.

The health maintenance program with respect to these activities contains the following principles: (1) best service compatible with the practical functioning of the industry; (2) responsibility fixed by law; (3) observances of the rights of individual physicians; and (4) conformation with accepted public health procedures.

In the control of occupational diseases, the medical director is the health officer of the plant; it is he who must locate and correct the hazards and he must cooperate closely with the industrial hygienist in so doing. The physician is responsibe for the detection of physical impairments and must function as a case-finding agency. If the condition is occupational, industry must be responsible for treatment — if non-occupational, the responsibility is discharged when the report is made to the employee, but through a courtesy arrangement the industry can contact the family physician.

Physical examinations afford an opportunity for proper placement of men in good condition. (As an example of this, an arrested tuberculosis case was actually placed not on a shakeout operation but adjacent to an annealing oven.)

Routine x-ray films of the chest form an important part of the control program.

There were a number of cases cited with respect to difficulty in the home and in community conditions. Previous employment is a very important item in the establishment of responsibility, which is often beyond the control of the employer.

An example of good arrangement in Flint, Michigan, was cited, showing the cooperation built up between the private practitioners and industrial physicians.

The trend of the tuberculosis death rate is definitely downward in industry as against a rise in the general population, in the working decades —this is due to a very active tuberculosis program within industry.

Friday Afternoon Session

DR. E. E. EVANS presented the subject originally assigned to DR. G. H. GEHRMANN, "Objectives of Health Examinations and Their Industrial Applications."

At the outset it is important that the confidence of the employees be gained with respect to health examinations.

It must also be recognized that industrial medicine evolved mainly because of compensation laws. Physicians were early engaged in this type of work without proper qualifications with the exception of having a license; other physicians however, realized the great opportunity for the practice of preventive medicine in industry and have thus been directly responsible for building up this type of work to what it is at the present time.

An outline of medical service, especially relating to the chemical industry, was given by means of lantern slides.

In general, the duties of the department are to supervise health; prevent and recognize infectious disease; the recognition and advice concerning occupational disease; the treatment of injury and occupational disease; routine physical examinations; sanitary supervision; a knowledge of the operations and their hazards; and a direct responsibility to the industrial relations program.

It was especially emphasized that the physician must know the operations and the hazards attendant thereto, in order that the physical and health examinations may be of real service.

In a chemical plant, the processes and materials must likewise be understood and in this connection the research laboratory can do signal service both for employees and for the public consumer.

The taking of a proper history is of great importance in discovering incipient occupational disease, as are also special laboratory methods.

As an example of the type of chronic illnesses discovered in routine physical examinations within a period of one year, the following list was tabulated: tuberculosis—107; cardio-respiratory—90; diabetes—12; nephritis—11; bladder tumors—52; silicosis—5; pneumoconiosis—12; pneumothorax—8; and aspergillus—13. It is of interest to know that all of these were existent previous to employment except the bladder tumors.

Of 42 rejections on the basis of x-ray findings, 36 were due to tuberculosis; two to tumors; one to pneumothorax; and three to chest deformities.

Numerous x-ray examples were shown of tuberculous processes; of silicosis; of variations in the anatomy of the spinal column; and also with reference to kidney and ureter pathology.

Another important subject in industry today is the proper control of syphilis. Employees in this organization are not dismissed except when they are hazardous to others. In 1933 it was discovered that there were 6% of positives in the plant population, while at present there are less than 3% positives.

In a chemical industry also, dermatitis represents a problem. Of these, there are two types, primary and sensitized. A number of colored lantern slides were used to illustrate the types of dermatitis which are encountered in the chemical industry. During the period 1933 to 1938, the number of cases of dermatitis has been greatly reduced in chemical manufacturing groups.

Finally, it should be said that industrial medicine is a definite specialty and that it has certain toxicological aspects which are very important in the chemical industries. Examinations, proper diagnosis, adequate surgery, are all important but most important of all, is the essential practice of preventive medicine, through which real benefits may be gained and of which the initial and periodic examinations are important bulwarks.

DR. RAYMOND HUSSEY discussed the subject "The Private Practitioner and Industrial Health Examinations."

Industry is a great deal more health conscious today than ever before and is probably taking advantage of the example in pediatrics where approximately 90% of the work is preventive in type. Adult health is fast coming to parallel the pediatric example and the credit goes to industrial medicine.

Fitness for employment means both mental and physical fitness, but the former has not found a very practical technique. Important developments have been (1) objections by labor to physical examinations and other procedures; (2) the Wisconsin Plan for Examinations which is commendable and deserves a repetition in other states: there is an attempt to establish such a program in Maryland at the present time; (3) the work of the Council on Industrial Health of the A.M.A. encouraging the use of examinations in industry; and (4) the splendid work of the Air Hygiene Foundation, together with the work of medical directors in large groups.

Industrial medicine parallels the development and evolution of public health, that is to say the situation in industrial medicine is similar to what it was in public health 30 years ago.

There has been little teaching in preventive work in industry until very recently. And this applies also to university health services. Student health examinations are now done by a special staff at the entrance of the student in his school life and also done periodically; it is well known that tuberculosis is the outstanding hazard of the student's life.

It might be that the medical student might well work during two summers in an industrial medical department with a better appreciation of what is going on within industry. Thus future medical men in this line of work could be stimulated and encouraged.

It is probable that 80 to 90% of industrial work is done by the private practitioner today and here

difficulties arise through lack of adequate experience.

Management feels that the part time physician is not conversant with various preventive measures as well as the personnel relations man.

Three county society committees on industrial health have had unusual experiences in the examination of men and women and have been extremely interested in following through the problems raised by these conditions. It is felt that at least 20 minutes should be required for an examination and there was a question as to whether examinations should be done by one person or by a team. X-ray films it was felt, should be limited to those with significant physical signs or done on those in whom there was a definite tuberculosis hazard known.

The criteria accepted in examinations divides groups of employees into six categories as noted: (1) fit for any employment; (2) minor defects—employment conditional on the remedying of such defects; (3) recommended for special positions only; (4) having major deffects—must be corrected before employable; (5) vocational defects; and (6) non-employable.

MR. THEODORE C. WATERS completed the program in his address on "Physical Examinations in Employment from the Legal Viewpoint."

Considerable impetus has been given by the occupational diseases acts in the various states, which has stimulated health conservation in industry.

In previous compensation acts, the provisions for rules and regulations to minimize industrial injury were well recognized; more recently the occupational disease amendments have primarily related to compensation, but preventive measures are also now being studied. Both engineering and medical methods of control must be used.

Considerable controversy has arisen with respect to physical examinations. However, when an act becomes effective, the employer becomes the insurer of the health of his employee and necessarily desires that his employees be given examinations.

Labor has objected to the examinations because (1) something might be found due to previous employment; (2) discrimination might be practiced; and (3) the use of the findings might be made in compensation hearings.

It is, however, a fact that in the absence of statutory provisions prohibiting examinations, the employer does have the right to examine his prospective employees.

A number of state laws were commented upon with respect to different provisions. The Ohio law provides that every employer must use means and methods to prevent diseases occurring because of employment and provides rules and regulations for examinations.

There is considerable difference in the various state regulations. New Mexico provides for preemployment examinations. Louisiana, Maine, New York and New Jersey provide for special examinations for compressed air workers; Missouri, New Jersey and Illinois provide for examinations for lead workers. Missouri is unique in that its statutes require examinations for those exposed to numerous poisonous metals, minerals and chemicals on a monthly basis.

With reference to silicosis and asbestosis, North Carolina provides examinations for employees when exposed to the hazards of such diseases.

The Wisconsin plan for examinations was outlined and discussed, including the declaration of principles and the recommendations of the Medical Committee. It was pointed out that this was an unusual arrangement, being adopted in 1938 by agreement with industry, labor and insurance companies.

It is only through such cooperative work with industrial hygiene bureaus, commissions, medical boards, as well as employers and employees, and insurance companies that any real progress can be made in the control and prevention of injury and occupational diseases.

Hand Injuries

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WHETHER a person's occupation consists of what is generally called brain work or of manual labor, the hand bears an important part in the day's work. The fact that a few, wonderfully endowed mentally and morally, having an indomitable will to achieve, have done great things without hands does not argue against the fact that hands are essentials to the ninety-and-nine. A hand injury of any consequence should be recognized as a handicap, if not a disaster.

Some 75 years ago an 18 year old North Carolina boy had both hands ground off in a cane mill. At that time he had the barest rudiments of an education; yet he became one of the greatest scholars of his time, a college president, and one of the best wing-shots in the State. But not one in ten thousand can do what Vann did.

A simple injury to a finger, if neglected, may cripple irreparably, and by extension to the hand, or farther, may occasion loss of the member, or even of life.

The treatment given a hand injury in the first 24 hours governs, to a great extent, the outcome. I might say that every minute is precious, that minutes may decide the issue of either good or poor results.

MY FIRST acquaintance with hand injuries began when I was a very small boy. One of our neighbors accidentally stuck a pin into his hand and a week later died of septicemia. This made a profound impression upon my mind and I have never forgotten it. Hand injuries vary

Read at a Meeting of the ASSOCIATION OF PENNSYLVANIA RAILROAD SURGEONS, St. Louis, Missouri, October 11-12, 1940.

from very minor injuries to destructive injuries which place the hand beyond any means of repair. But many times injuries we regard as minor turn out to be major indeed.

In this paper, I want to discuss the type of injury which we often find: a contused, lacerated or incised wound, involving the superficial and deep tissues, with possible injury to the blood vessels, nerves and tendons, and further complicated by soiling with polluted soil and other infectious material.

In these hand injuries, the most important thing is immediate and proper treatment. Careful inspection of the hand should be made and emergency treatment immediately planned. The final treatment is planned according to the findings after the hand is thoroughly cleansed and debridement completed.

Where there is even a remote possibility of injury to the bones, an x-ray examination should be made. A well organized clinic usually has a photographic department and a photograph of the hand in colors, together with drawings and diagrams, should be made, showing the exact nature of the injury. A medicolegal element exists in nearly all these cases, and in many of them the possibilities of utilization of color photographs, taken when the patient is first seen and at proper intervals thereafter, will constitute very effective evidence in court — or as a means of keeping out of court.

In treating hand injuries, the first thing is to relieve pain, usually best done by blocking the nerves to the hand with a local anesthetic. This choice permits the patient to move each finger separately as directed, to test the action of the tendons, nerves and muscles, and is a great help in making an accurate diagnosis. It also permits cleansing and debridement without pain to the patient.

In cleansing the hand, if it is badly soiled, it is well to pack the larger and deeper wounds with sterile gauze which has been soaked in paraffin oil to keep out infectious material from the deeper tissues. One of the best cleansing agents for surface use is plain gasoline, although, as a rule, we use sterile water and tincture of green soap. After the superficial parts of the hand are thoroughly cleansed, it is well to carefully remove any dirt from the deeper tissues and then cleanse the entire hand again with running water and soap. Then, after drying the hand carefully, paint the deeper tissues with a weak solution of tincture of iodine — I believe 3% is the most satisfactory strength for use in the average case for doing a minimum of damage to tissues, a maximum of destruction and inhibition of bacteria. Colloidal iodine is non-irritating and gives satisfactory results. The important factor, however, is to get the wound as clean as possible. Then the hand should be placed on a sterile towel and the doctor should change his gloves, which gives additional protection against infection. With reinspection of the hand and a careful survey of the damage done, an accurate plan can be made for the immediate and future treatment of the injury. A good light is important, otherwise foreign bodies such as glass might be overlooked.

When the second cleansing is completed, or before the first, if there is much bleeding, elevate the hand for a few moments to allow the blood to drain down to the shoulder and then, with the arm in the elevated position, apply the cuff of a blood pressure apparatus and pump to 200 mm. of mercury, or perhaps a little more; this stops the circulation of blood and prevents bleeding of the hand. This is a great help and enables a thorough cleansing and inspection of the hand to be done without interference from bleeding. It is all right to leave the arm band on for 15 or 20 minutes, usually ample time for inspection, cleansing and dressing.

Injuries to the nerves should be repaired at once, if possible. The subject of tendon repair is too great to be taken up in detail in this paper; however, some repairs can be done immediately, while others must be delayed. In case the flexor sublimis tendon only is cut, it may be advisable to remove both ends of the severed tendon and suture the proximal end of the sublimis in the palm to the profundus tendon. The important problem, however, is to plan the repair or replacement of injured tendons so as to get ultimately good motion of the fingers. Where both tendons are cut, it is sometimes very difficult to get good flexion because of adhesions between the point where the tendons were sutured and the surrounding tissues. Often it is necessary to depend upon tendon transplantation in order to get the best possible results.

All hand injuries of this type should be hospitalized immediately. All treatment should be carried out in a well organized operating room and with the most painstaking care. Following the immediate cleansing, debridement and treatment of all hand injuries, it is well to remember to keep the hand in its proper position, that of semiflexion. If the hand is put up with the fingers extended on a splint, stiffness is almost certain to result.

After the first-aid treatment of the hand is completed, we find it advisable to expose the hand to ultra-violet light. This should be done carefully and by someone experienced in the use of this potent agent so as not to do any damage. Combined tetanus and gas-gangrene antitoxin should be given. To aid further in preventing the development of gas-gangrene, it is our custom to give 80 to 100 *r* of x-rays at once. Putting the patient under a light tent with a light dressing on the hand is another important step in the treatment. We emphasize the light dressing in order that it may be removed easily, allowing frequent inspections.

Since streptococcic infection is that most likely to cause sloughing of the tendons, lymphangitis, prolonged disability, septicemia and even death, in hand injuries of any great severity, sulfanilamide or neoprontosil should be given. Neoprontosil may be given intramuscularly if the patient is unable to take medicine by mouth. This, I am convinced, is of great help in the prevention of

complicating infections and should be given in the majority of cases.

This covers the first hour or so of treatment and from this point on every effort should be made to restore the anatomical and physiological function. Massage, passive and active motion, baking, inductotherm are all useful at times in obtaining the best results.

Conclusions:

THE first 24 hours' treatment, especially the first hour after hand injuries, governs to a large extent the outcome.

2. Hospitalization is advisable in most hand injuries.

3. Color photographs are excellent records in many cases, and very convincing to lawyers and juries.

4. At the time of the cleansing of the hand, a careful survey and accurate record should be made of all injuries.

5. It should be kept in mind that every possible means to obtain a good result should be used in treating hand injuries. Baking, inductotherm, passive and active motion, massage — each has its place.

6. The hand should be inspected frequently.

7. Weeks or even months of treatment may be necessary in order to get the maximum improvement, and treatment should be continued until the best possible results have been obtained for the patient.

8. Patient and persistent treatment of these patients along proper lines will often give results far beyond our expectation and frequently much better than the patient hoped for.

9. The restoration of anatomical and physiological function should be the main consideration in the treatment of hand injuries.

Shock

WILLIAM O. MCMILLAN, M.D.,
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ONE of the most important surgical and medical problems is that of shock. The term "shock" was first used by James Latta in 1795 to describe the clinical picture we see so frequently today in our machine age. Blalock has recently introduced the phrase "peripheral circulatory failure" to more closely fit the clinical picture and, if possible, replace the term "shock." This presentation will chiefly deal with peripheral circulatory failure associated with trauma to gross tissues and also that of external hemorrhage. It has been shown experimentally and also clinically that patients may suffer the effects of hemorrhage due to a decrease in the circulating blood volume although there may be no external loss of blood, but only a loss in blood plasma into the traumatized tissues at the site or near the point of trauma.

Read at the Fifty-First Annual Meeting of the AMERICAN ASSOCIATION OF RAILWAY SURGEONS, Chicago, September 18, 1940.

We may consider for a moment the reported causes of traumatic peripheral circulatory failure. Among the numerous theories advanced are the following:

1. Inhibition,
2. Fat embolism,
3. Suprarenal hyperactivity and hypoactivity,
4. Acidosis,
5. Vasomotor exhaustion,
6. Vasoconstriction,
7. Toxemia,
8. Local loss of blood and fluid.

It has been shown that all of these factors may play an occasional or contributory role in the condition, but in recent years for the most part, most consideration has been given the last two theories, those of toxemia and local loss of blood and fluid. Members of the last World War Shock Commission were advocates of the toxemia theory, these workers believing that a histamine-like substance formed in the tissues was the deciding factor as the causative mechanism in the fall in blood pressure and associated findings. This concept was reached chiefly by experiments which tended to exclude other causes but never definitely gave a positive proof of the presence of such a toxin. More recently, Blalock, Phemister and their coworkers have performed experiments which have shown that the loss of blood and fluid into the damaged tissues was most often the cause of this type of circulatory failure.

Various experiments were carried out to verify these observations. Extremities of anesthetized animals were subjected to trauma until a state of peripheral circulatory failure existed. The edema fluid of the traumatized extremity was found to consist of blood and plasma. It was further observed that the amount of blood and plasma lost from the circulation into the adjacent tissues was sufficient to produce profound peripheral circulatory failure. The depletion of the circulating blood volume was shown by determining the bleeding volume of animals with a low blood pressure produced by numerous methods. When a carotid artery cannula of a normal dog is opened about 58% of the calculated blood volume of the animal will be obtained. An animal with a low blood pressure resulting from histamine administration and the associated capillary dilatation will bleed about 50% of its calculated blood volume. In contrast to these observations is the fact that the blood volume of animals with low blood pressures resulting from severe trauma to extremities and from loss of blood volume by external hemorrhage is only 24%. This leads one to conclude that there is definitely less fluid within the lumen of the vessels.

It has also been shown that an extract made from traumatized muscles and administered to a second animal failed to demonstrate the presence of a potent toxin in the injured tissues. During the last World War, a good many cases of so-called "traumatic shock" were observed as a result of massive wounds. Some of these men so wounded with lower extremity trauma required the appli-

cation of tourniquets. Because of circumstances, the tourniquets in some cases were left on for many hours. In some, it was observed that, although when the tourniquet was removed the patient was in fairly good condition, subsequent to the release a state of shock, which gradually grew worse, developed. This occurred even though there was no external loss of blood after release of the constrictor. Also, it was noticed that there was a marked swelling in the extremity which developed at the same time the blood pressure started to fall.

Studies of the blood pressure curve of both patients and animals have been made, following tourniquet use. In those who have had the constrictor in place for an hour or over, there was often a temporary decline in pressure; this however was soon followed by recovery. In the animal experiments, the time of constriction was much longer to compare with the long intervals of application of constrictors in the wounded mentioned in the war observations. In these prolonged instances of constriction, release was followed by great swelling of the extremity and a profound and usually fatal fall in blood pressure. Studies of the edema fluid of the involved extremity showed it to consist mainly of blood plasma. The amount of fluid *loss* into the tissues was determined by comparing the weights of symmetrical extremities and was shown to be sufficient to explain the fall in blood pressure and other findings of peripheral circulatory failure. This should be noted as a factor other than nerve injury associated with prolonged constrictors to the extremities.

Treatment and Prevention of Shock

STUDIES in the prevention of shock have more than kept pace with advances in the treatment of the fully developed condition. If treatment is to be carried out intelligently, one should know as much as possible about the character of the alternations that have resulted in peripheral circulatory failure. It is important to ascertain whether the dimunition in the effective circulating volume of blood is due in the main to vasodilatation or to an actual loss of fluids with vasoconstriction. In the latter type the use of drugs which induce further vasoconstriction not only does no good, but may cause harm. An increase in the supply of blood and oxygen to the tissues, and not an elevated pressure in the arteries, is the need. If one is in doubt as to the nature of the disturbance of the peripheral circulation, it is better to resort to transfusion of blood.

Regarding drugs, for the care of the patient in shock a number of vasoconstrictor drugs have been recommended. With the exception of the use of vasoconstrictor drugs to combat the effects of vasodilator ones, such as spinal anesthetic agents, it is felt by a good many workers on the subject that the sum total of the ill effects of the administration of such drugs in the treatment of peripheral circulatory failure is greater than the benefit that is derived. Often more effective means of therapy are put off too long because of too great confidence in the use of vasoconstrictor agents. Digitalis has been found harmful in peripheral circulatory failure and in the absence of heart disease, has no indication for its usage. Morphine, of course, is excellent for prevention of pain and restlessness. However, the dosage should not be so large that it causes medullary depression and thereby accentuate the clinical picture.

Blood Transfusion

AS brought out, the most important abnormality in shock is the defect in the effective volume of circulating blood. After this reduction, the most effective mode of therapy consists of supplementing the volume by the intravenous introduction of fluid, preferably blood. Formerly it was used as a procedure of last resort, whereas at present, transfusions are probably used more frequently for the prevention of, than the treatment of peripheral circulatory failure or shock. The increased demand for blood has brought about the method of "Preserved blood." The following was recently published:*

"The obvious advantages of storing blood for transfusion have led to the adoption of 'blood banks' by many large hospitals throughout the country. With the grouped and serologically tested blood always available, precious time is saved in the emergencies that so often arise in accident and surgical cases. In time of war this becomes even more important than in civil life. In addition, there is a large financial saving, since there is less need for professional donors."

A blood bank has been used for several years here in Chicago at the Cook County Hospital. Fantus states that the sodium citrate method of collecting blood has permitted of it remaining in perfect condition for from seven to 10 days. The sources today are the cadaver, the placenta and professional and voluntary donors.

Blood serum is suitable for the treatment of this condition, but it is seldom available in suitable quantities. Intravenous saline or glucose may be used as only temporary measures to boost the pressure while the patient is being typed. Saline and glucose alone remain in the vessels only a short time, and there is evidence to show that when not followed by blood, these agents may tend to even wash more proteins out into the damaged tissues. When, in the course of treatment of a patient, it is found that the plasma protein is decreasing while the concentration of the red blood cells is increasing, it can mean only that plasma is being lost from the blood stream and that nothing is being accomplished. Tissue edema, rather than an effective increase in the blood volume, occurs.

Other fluids which can only be considered and should not be used if blood is available, include the use of ascitic fluid, amino-acid mixtures and gum acacia solutions. Acacia has been used with reported success; however, there have been deaths reported following its usage, a clogging of the reticulo-endothelial system being blamed.

* In *J.A.M.A.*

There are other important and well-known methods in the treatment of shock which cannot be overlooked. These include meticulous handling of tissues, careful hemostasis and keeping the patient warm and dry. If a general inhalation anesthetic agent is used, a mixture containing a high percentage of oxygen should be used. The employment of oxygen in the prevention of shock has received too little attention.

The immobilization of fractures in temporary splints before the patient is transferred from the scene of injury should always be carried out. The army slogan of "Splint them where they lie" still holds.

Finally, in the enthusiasm which is so often ours in doing everything possible to prevent peripheral circulatory failure, we forget that the patient needs rest. Over treatment is a reality in some instances.

Contact Dermatitis

—*From a Plastic Wrist-Band*—

Oscar L. Levin, M.D.,
and
Howard T. Behrman, M.D.
New York City

THE widespread use of different materials in the manufacture of wrist-bands and bracelets has greatly increased the incidence of localized forms of dermatitis. Irritation of the skin has been reported following the use of nickel-plated wristbands,[1] cocobolo bracelets[2] and many allied substances. The following case is reported because the increased utilization of synthetic plastics in the manufacture of costume jewelry and wearing apparel lays open new avenues of cutaneous reactivity.

Report of a Case

A COLLEGE student, S.S., aged 18, was referred for diagnosis and treatment on July 17, 1940.

The history disclosed that the patient had purchased a transparent plastic wrist-strap at a department store on July 3, 1940. After wearing this band for 10 days, he noticed several red spots on the front of the left forearm, corresponding in location to the encircling strap. The red spots gradually enlarged and spread around the wrist involving the entire circle of the skin in contact with the band. This elevated red band was covered with denuded vesicles which exuded a thin, serous discharge. Itching was marked. The lesion was slightly larger than the wrist-band indicating a tendency of the skin reaction to spread past the confines of the directly contacted sites. A diagnosis of dermatitis venenata was made.

It was not possible to perform patch tests on the patient but scrapings were made from the surface contiguous to the skin. These scrapings were employed for the performance of patch tests on four other individuals. Twenty-four hours later the tested areas were examined and it was found that the patch tests were negative. The scrapings were reapplied for another 24 hours at the end of which time, there were still no perceptible signs of cutaneous reactivity.

The patient was advised not to resume wearing the bracelet. Treatment consisted of the local application of a soothing alkaline liniment and wet dressings of dilute aluminum acetate solution.

After five days, the patient returned and when examined, the inflamed area on the forearm appeared scaly and dry. The pruritus had subsided. The patient was advised to continue the local applications until the lesion involuted completely.

Comment

THE tremendous strides in the manufacture of chemical plastics have made available a large number of synthetic derivatives for jewelry and wearing apparel. Where gold, copper and plated materials were formerly employed in certain types of costume jewelry, they have been recently replaced by numerous cheaper synthetic substances. In addition, articles of clothing such as stockings, corsets and similar items are now being made of composition materials and are being used for lightness, comfort, and new style effects. All of these materials are capable of irritating the skin under certain specified conditions.[3] It is well known that the degree to which the skin will react to an outside irritants depends on several factors include the strength of the causative agent and the susceptibility of the individual. Certain agents are capable, per se, of producing a dermatitis without regard for the hypersensitivity of the individual. These are known as direct irritants and numerous acids and alkalies are included in this group. Other external irritants will produce a dermatitis only after the skin has been affected by moisture (perspiration), heat, pressure, trauma or similar physico-chemical factors. The susceptibility of the individual depends on a wide variety of possible causative agents. These may be congenital or acquired, and may be in the nature of idiosyncrasies or allergenic manifestations. In this patient, the reaction would be classified as one of delayed hypersensitvity inasmuch as over two million similar wrist-bands have already been used and very few reports of dermatitis have appeared as yet. The basic ingredients of these wrist-straps include vinyl resins with added plasticized flexible sheetings. The plastic materials contain phosphates, phthalates and numerous other ingredients with such a variety of formulae as to render it impossible as yet to trace any single specific product. The vinyl resins rarely produce skin reactions but the plastic substances may produce cutaneous manifestations although very few have been encountered industrially. These substances are not direct irritants but give rise to reactions of a delayed type. In no instance has a dermatitis appeared in less than one week, and in the average case there is an incubation or sensitization period of from three weeks to six months. When the individual is once sensitized however, a reaction may be elicited within 24 hours by the

Dr. A. G. Cranch, Industrial Toxicologist of the Carbide and Carbon Chemicals Corporation of New York City, gave many helpful suggestions as well as the industrial reports mentioned in this paper.

same or similar substances. In two cases of dermatitis following prolonged contact with plastic wrist-bands, transferral of the bands to the opposite forearms provoked local reactions within 48 hours. That these flexible plastics are impervious to moisture is another important factor in the production of skin reactions. The accumulation of perspiration under the band and the resultant biochemical changes will increase local reactivity. When the bands were first sold, they were not perforated and cutaneous reactions were noted in several instances. Very recently, one manufacturer has produced a band with multiple perforations and as yet there have been no reports of local irritation from this particular wrist-strap. The possibility of sensitization to the decomposition products of perspiration should be taken into consideration.

Summary

AFTER wearing a bracelet made of transparent plastic, a plasticized flexible sheeting, the patient developed a localized dermatitis at all points where the bracelet was in direct contact with the skin. When the bracelet was discarded and soothing applications were employed, the dermatitis venenata subsided. The modern utilization of plastics and synthetic materials as jewelry and wearing apparel should be duly considered when investigating the possible sources of a contact dermatitis.

Bibliography:

1. LAIN, E. S.: Nickel Dermatitis: A New Source, *J.A.M.A.* 96:771-772 (March 7) 1931. Fos. J.: Nickel dermatitis from Spectacle Frames and Wrist Watch, *ibid.* 101:1066-1067 (September 30) 1933. DOWNING, J. G.: Cutaneous Eruptions Among Industrial Workers, *Arch. Dermat. & Syph.* 39:12-32 (January) 1939. GILMAN, R. L.: Nickel Dermatitis, *J.A.M.A.* 96:1331 (April 18) 1931.

2. LEVIN, O. L., and BEHRMAN, H. T.: Bracelet Dermatitis, *N. Y. State J. Med.* 39:1877-1879 (October 1) 1939.

3. ZEISLER, E. P. Dermatitis from Elasti-Glass, *J.A.M.A.* 114:2540-2542 (June 29) 1940.

Medical Service in Industry

THE following article is the second in the series of articles on "Medical Service in Industry" which, prepared with the approval of the Council on Industrial Health, will appear from time to time in the *Journal of the American Medical Association.* This is from the *Journal* for October 12, 1940:

INDUSTRY'S earliest medical need was for competent surgical treatment of injuries actually or likely to become compensable. For most employers this obligation remains the most important and often the only motive for providing medical service. Consequently this relationship is the sole point of contact with industry and industrial health methods for most physicians. Many factors tend constantly to modify this traditional concept of medicine's usefulness to industry. Society through occupational disease legislation demands that industry protect its employees not against accidents alone but against any harmful health experience associated with work as a cause. Experience in the safety movement turns the attention of employers to prevention as a cardinal principle for lowering the incidence of disability suffered by workmen whether through accident or disease, industrially induced or otherwise. This attitude is significant. It implies a gradual but steady reduction in the amount of required remedial service now provided by industrial medicine and surgery. In place of it the physician in industry will be asked to supply more and better preventive medicine, employing methods, equipment and special information now falling within the province of industrial hygiene.

Value to the Employer

AS A rule an employer adopts a plant medical program containing functions beyond his legal obligation because he is convinced that such practices represent an improvement in the conduct of his business. Therefore a physician who is asked to supply these services should make it a point to comprehend the nature of the business with which he is to be associated and to understand how and why he can be of value to it. The essential purpose of any industry is the development of goods and services of such quality and price as to permit the widest possible distribution. Procedures calculated to accomplish this purpose are well defined by custom and long experience in many industries. Elsewhere they may be exceedingly complicated. Often extensive consumer research is necessary, as well as designing of an engineering nature. Markets must be developed, sustained and augmented by advertising and efficient distribution. Competition must be met, restrictive legislation conformed with, and provision made for taxation and finance. Facilities for the conduct of the business must be provided with proper equipment so arranged as to promote efficient production. Workmen must be employed and trained for specific jobs under competent supervision. Sound business management requires that trained manpower be conserved, kept in good physical condition and maintained steadily at gainful employment. It is through the successful accomplishment of this maintenance function that the physician in industry can make himself most helpful and not infrequently indispensable.

Value to the Employee

THE first objective of all industrial health activity is to promote the physical welfare of every worker. Certainly the interests of employer and employee are most nearly identical under an arrangement which tends to reduce all loss of working time because of sickness or injury. Individual workers stand to gain substantially in every instance in which the industrial medical service is competently and fairly administered. The advantage to the worker rests not solely on improved earning power through steadier employment but by proper placement in work fitted to his physical and temperamental makeup.

Scope of Industrial Health

THESE values, which have been assigned by employer and employee alike, are responsible for the growth of interest in industrial health and for increasing demands on physicians to supply medical services to industry. This interest has been productive of much good as well as of some misdirection and abuse. The medical profession has as a result developed a point of view which has the intent of defining the proper scope of industrial medical activity and of unqualifiedly condemning conditions which make it impossible to maintain adequate standards of medical performance.

In keeping with this broad opinion, the Council on Industrial Health believes that a properly administered industrial health program should:

1. Prevent disease or injury in industry by the establishment of proper control over industrial environment.

2. Promote restoration to health and earning capacity as promptly as possible after industrial injury or disease.

3. Conserve the health of workmen through physical supervision and education.

These are expressions concerning scope and not of specific functions. On the acceptance of these principles rests the justification for the development of industrial health as a special field of medical interest distinct from private

practice and through which at the same time the aims of industrial and private practice are reconciled.

Current Commet

Abstracts by

Emery R. Hayhurst, M.D., Ph.D.,
Columbus, Ohio

The Medical Bulletin

WE HAVE had occasion before to comment both editorially and with abstracts re *The Medical Bulletin* which is edited by Drs. Willard J. Denno, Alvin W. Schoenleber, James M. Adams, Alfred Gage, and Robert C. Page.

The present issue* brings papers from Sumatra. They begin with an Annual Report of Dr. P. Tekelenburg who discusses the status of health conditions among employees and their families—reported as satisfactory throughout 1939, where tropical diseases such as malaria and dysentery are rare among the foreign employees, and native health conditions very good when compared with natives not working for the company. Malaria "explosions" did occur in two camps as well as among geological parties scattered throughout Sumatra and Borneo, where control is difficultly possible. This report covers a grand total of 11,364 persons who enjoyed free medical treatment. A diagram shows the organization of the medical staff, while there are a number of photographs of hospital and other service buildings and native quarters. Tables and descriptive material relate to each locale and a goodly portion is devoted to the hygienic and sanitary work performed.

A second annual Statistical Report pertains to the Nederlandsche Koloniale Petroleum Maatschappij, involving 15,793 persons entitled to medical service, in which the frequency rates for deaths among employees were remarkably favorable during 1939 for a tropical country. Malaria continued to be the leading cause of disability, with the common cold and influenza in second and third places, but general health conditions among employees were better than in most other countries. The primary reasons for the low sickness frequency was due to the low rates for minor gastro-intestinal diseases and the common cold. No doubt anti-malaria prophylaxis and sanitary measures accounted for commendable reductions in malaria and amebic dysentery.

Dr. F. V. B. Dumoulin, Talang Akar, reports upon the malaria situation in a Southern Sumatra oil field in relation to the European war. A marked increase in hospital admissions for malaria occurred in the latter months of 1939, attributable to a spurt in clearing the jungle for far greater cultivation than usual, stimulated by the local government. The company succeeded in controlling this situation on its own concession but, still, alarming changes took place in the mosquito situation in the vicinity due to the opening up of new anopheline breeding places, from which it is most desirable that the company extend its sanitary measures beyond the regular one-mile limit.

Dr. J. Bryan, Sonegei Gerong, gives a preliminary report on a new method of early syphilis treatment, following along the lines of van Putte in the clinic of Prof. Tzanck in Paris — the administration of large quantities of neosalvarsan by an intravenous drop method. Ehrlich's ideal was the cure of syphilis by one injection. Dr. Bryan's technique (which is described in some detail) consisted in administering the agent in three intravenous injections within 50 hours, in each of which injections the patient received, in two and one-half to three hour's time, approximately 1500 milligrams of neosalvarsan at the rate of 20 drops per minute of a 1% solution in physiologic saline. Hymann's and Tzanck's method was followed and greatly reduced the danger of the treatment. Within one day no living spirochetes were found, using 10 patients showing primary or secondary syphilis. Varying with body weights, the patients received 15.6 to 34 milligrams of neosalvarsan per day per kilogram bodyweight. There was a primary fever reaction, sometimes with chills at time of injection, which seldom lasted longer than 24 hours. Secondary fever, if any, was usually less and appeared on the second or third day, the longest duration being four days. There were no dermatitis or neuritis complications. Only the man who received 34 mg. per kilogram bodyweight showed albuminuria, which was severe on the third day but disappeared within four days. There were no abnormal liver manifestations. Hospitalization varied from six to 10 days. Within three months, the Meinicke and Kahn tests became negative in three patients, reduced in three others, three cases could not be followed, and in the remaining one who was tested for nine months, the tests continued about as positive as before treatment. The point which the author wishes to stress is that such massive dose therapy is not dangerous, based on his 10 cases. It is hoped to observe the treatment on more cases.

The diagnosis and treatment of bacillary dysentery was reported by Dr. F. C. Hollander and Laboratory Technician M. Soebine, also at Soengei Gerong, where the Kruse Sonne bacillus had already been demonstrated as the cause of children's diarrhea in Sumatra, with polluted river water as the undoubted source, based on the isolation of other dysentery bacilli. The technique of feces culture is described, and the clinical picture of acute, slight and chronic cases. Serum was administered in acute cases with a saline laxative followed by an astringent and perhaps tincture of opium along with special attention to the diet. In chronic cases, special oral and enemal treatments were used. Four deaths occurred in 81 cases which were severe enough to be hospitalized.

A case history of a ruptured uterus in a multipara is given by Dr. Tekelenburg, which showed almost complete absence of classical signs and symptoms including hemorrhage and shock. Here the placenta was located in the uterine tear.

This interesting bulletin concludes with various items of staff news concerning this world-wide organization.

Detection and Control of Silicosis

THIS is a report* addressed to the members of the New York Legislature based upon the program for which the Legislature had appropriated $50,000 a year for five years, effective July 1, 1936. These funds were allocated to the Division of Industrial Hygiene which developed the necessary procedures. The doctors conducted 37,850 medical examinations, and there were 17,229 chemical analyses and determinations. During the three and one-half year period, 4,808 plans for ventilating systems and other methods of controlling dusts and fumes were examined by industrial hygiene engineers, involving 23,426 machines protecting 39,317 workers. As a result, the health of nearly 300,000 workers in dangerous trades in New York has been made safer.

Twelve experts were added to the industrial hygiene staff. An x-ray truck and a ventilation laboratory were developed and a chemical laboratory completely reorganized and enlarged. The project was in charge of Dr. Leonard Greenburg, Director of the Division.

The silicosis problem in foundries, whose workers have set the silicosis compensation rates in the State, the Delaware aqueduct with its 85 mile water-tunnel through the heaviest silica-bearing rock—360 drills operating at the same time, and more than 10,000 tons of rock removed daily—both of these have been negotiated with the result that dust control measures have been taken which can unquestionably prevent silicosis. Attention was also given to other dust diseases where x-ray pictures have

* *The Medical Bulletin.* Standard Oil Co. (N. J.). Vol. 4, No. 5, August, 1940.

* "Detection and Control of Silicosis and Other Occupational Diseases." Frieda S. Miller, New York State Industrial Commissioner. March, 1940, 21 & X pp., mimeotype, with illustrations.

been taken of over 7,000 workers in 120 plants, and complete physical examinations of 1,452 workers exposed to such dusts as those containing mercury, aniline, wood dyes, moth repellants, fertilizers, plastics, etc., and over 3,000 special clinical tests. Plan examination, technical assistance on engineering control measures and medical control measures as well as education are the answers to "Other Dust Diseases."

Under "Other Occupational Diseases," chronic mercury poisoning in fur felt hatmakers, the danger of methyl cellusolve poisoning in the process of "fused collars" in the non-starched collars procedure, carbon monoxide—especially in relation to hat pressers and in public garages—and stress on keeping up on new poisons, are the chief items of discussion.

The report ends with a Statistical Appendix showing the estimated number of persons affected by activities of the Division since July 1, 1936, and the types of pertinent activities; medical procedures undertaken in medical examinations; industries included under "Miscellaneous Dusty Trades;" the chemical laboratory report upon different samples; exhaust systems for control of industrial dusts of various classes and for substances other than dusts; as well as a bibliography of articles on industrial hygiene published by the workers of the Division between 1936 and 1939.

Air Hygiene Foundation

FOLLOWING is the Program of the Annual Meeting of AIR HYGIENE FOUNDATION, to be held at Pittsburgh, Pennsylvania, November 12 and 13, 1940:

Tuesday, November 12, 9:30 A. M.

OPENING — ROGER A. HITCHINS, Chairman, Board of Trustees.

"Industry and the National Emergency"—DR. E. R. WEIDLEIN, Director, Mellon Institute, Head, Chemical and Allied Products Division of Advisory Commission, Council of National Defense.

"Foundation Activities In 1940"—H. B. MELLER, Managing Director.

"Review of Recent Occupational Disease Legislation"—THEODORE C. WATERS, Legal Committee, Chairman, Maryland Occupational Diseases Commission.

"Report of Preventive Engineering Committee"—PHILIP DRINKER, Chairman, Preventive Engineering Committee, Harvard School of Public Health.

Foundation Researches, Harvard University—

By B. D. TEBBINS — (a) "Control of Fumes Rods"; (b) "Significance of Particle Size in Silicosis."

By LESLIE SILVERMAN — "Design of Lateral Exhaust Hoods for Industrial Tanks."

"Report of Medical Committee"—DR. A. J. LANZA, Chairman, Medical Committee, Assistant Medical Director, Metropolitan Life Insurance Company.

"Foundation Study of Sick Absenteeism in Industry" — DR. W. M. GAFAFER, Senior Statistician, U. S. Public Health Service.

"Foundation Research at the Saranac Laboratory"; "Individual Susceptibility to Toxic Dusts"—DR. LEROY U. GARDNER, Director.

"Foundation Research at University of Pennsylvania"; "Further Developments in the Study of Effects of Toxic Materials on Living Tissue as Observed in the Living Mammal"—DR. ELIOT R. CLARK, Professor of Anatomy.

Wednesday, November 13, 9:30 A. M.

SYMPOSIUM — "Industrial Health Defense," PHILIP DRINKER, Presiding.

"Activities of U. S. Public Health Service in the Defense Program" — DR. P. A. NEAL, Acting Chief, Divn. of Industrial Hygiene, National Institute of Health.

"Health of Electric Arc Welders in the National Defense Program" — DR. CAREY P. MCCORD, Director, Industrial Health Conservancy Laboratories.

"Industrial Hygiene and the Navy in National Defense" — CAPT. ERNEST W. BROWN, (MC) USN, Navy Yard, New York.

"Absorption and Excretion of Volatile Solvents"—DR. HOWARD W. HAGGARD, Yale University.

"Health Requirements on Government Contracts, Including Importance of Good Working Standards in National Defense, and Health Requirements under the Walsh-Healey Act" — L. METCALFE WALLING, Administrator, Divn. of Public Contracts, U. S. Department of Labor.

"Protection of Civilians in War" — W. P. YANT, Mine Safety Appliances Co.

Report of Membership Committee — C. E. RALSTON, Chairman, Membership Committee, Safety Director, Pittsburgh Plate Glass Co.

Business Meeting. Closing by Chairman of Board.

American Conference on Industrial Health

A SYMPOSIUM on the Practical Value and Application of Industrial Health Work, will be held by the AMERICAN CONFERENCE ON INDUSTRIAL HEALTH, at Chicago Towers, 505 N. Michigan Ave., Chicago, on November 14, 1940, with the following program:

Morning Session:

DR. C. D. SELBY, Medical Consultant, General Motors Corporation, Detroit, *Presiding*:

FROM THE VIEWPOINT OF:

The Employer—MR. B. C. HEACOCK, President, Caterpillar Tractor Co., Peoria, Ill.

The Physician—DR. WILLIAM A. SAWYER, Medical Director, Eastman Kodak Company, Rochester, N. Y.

The Industrial Hygienist—MR. WARREN A. COOK, Zurich Insurance Co., Chicago.

The Employer—MR. D. A. MOORE, Western Electric Company, Chicago.

The Insurance Company—MR. AMBROSE KELLY, American Mutual Alliance, Chicago.

The Legal Profession—MR. FRANK PEREGRINE, of Peregrine and Bruegger, Lawyers, Chicago.

Labor—MR. MATTHEW WOLL, Secretary, American Federation of Labor, New York.

Luncheon Session:

DR. C. O. SAPPINGTON, Consulting Industrial Hygienist, Chicago, *Presiding*:

"The American Conference on Industrial Health"—DR. VOLNEY S. CHENEY, Medical Director, Armour and Company, Chicago.

"Industrial Health and the National Defense"—DR. PAUL A. NEAL, Chief, Division of Industrial Hygiene, U. S. Public Health Service, Washington, D. C.

Afternoon Session:

DR. E. C. HOLMBLAD, Medical Consultant, Railway Express Agency, Chicago, *Presiding*:

Employer-Employee Relations—MR. W. E. ODOM, W. E Odom Associates, Chicago.

Finance and Cost Accounting—MR. A. W. TORBET, C.P.A., of Frazer and Torbet, Chicago.

Employer Selection and Rating—MR. EUGENE BENGE, Chicago.

Safety—MR. F. A. LAUERMANN, Republic Steel Corporation, Chicago.

FROM THE VIEWPOINT OF:

Industrial Psychiatry—DR. LYDIA GIBERSON, Metropolitan Life Insurance Co., New York.

Public Relations—MR. RALPH L. LEE, Department of Public Relations, General Motors Corporation, Detroit.

Nursing—MISS JOANNA M. JOHNSON, Supervisor of Nursing, Employers Mutuals of Wausau, Wisconsin.

Research—DR. LEROY U. GARDNER, Director, Saranac Laboratory, Saranac Lake, N. Y.

Dinner Session:

OLIVER E. MOUNT, Secretary-Treasurer, American Steel Foundries, Chicago, *Presiding*:

"Industrial Health and the General Practitioner"—DR. MORRIS FISHBEIN, Editor, *Journal of the American Medical Association*, Chicago.

"The Humanitarian Appeal of Industrial Health"—MAJOR JOHN L. GRIFFITH.

The AMERICAN CONFERENCE ON INDUSTRIAL HEALTH was recently incorporated, not for profit, under the laws of the State of Illinois. This, its first meeting, is sponsored by the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, in collaboration with the following organizations:

National Association of Manufacturers, American Industrial Hygiene Association, Industrial Management Society of Chicago, Illinois Manufacturers' Association, The Greater Chicago Safety Council, American Foundrymen's Association, Casualty Adjusters' Association of Chicago, National Founders' Association, Division of Industrial Hygiene, Illinois State Department of Public Health, Health Department, City of Chicago, Chicago Industrial Relations Association, American Mutual Alliance, National Small Businessmen's Association, Chicago Unit, Association of Casualty and Surety Executives.

New York State Society

THE NEW YORK STATE SOCIETY OF INDUSTRIAL MEDICINE held its Twentieth Annual Meeting at Hotel Utica, Utica, New York, on Thursday, October 31, 1940, with the following program:

9:30—Motion Picture: "Steel Wire Sutures in Surgery" —DAN VICKERS, M.D., Attending Surgeon, Little Falls Hospital, Little Falls, New York.

9:45—Business session—Reports of officers—Election of Directors.

10:00—"The Role of Effect, Trauma, Work and Occupation in the Onset of Subsequent Course of Coronary Occlusion"—ARTHUR M. MASTER, M.D., F. A. C. P., Associate Physician and Physician in Charge, Cardiac Clinic, Mt. Sinai Hospital; Consultant and Cardiologist, Rockaway Beach Hospital and Pathologic Hospital, New York City.

Discussion:

ERNEST PHILIP BOAS, M.D., Associate Physician, Mt. Sinai Hospital, New York.

E. C. REIFENSTEIN, M.D., F.A.C.P., Professor of Medicine, Syracuse University; Consulting Physician, Psychopathic Hospital, Syracuse.

12:30—Luncheon—NOTE: All delegates will be luncheon guests of MR. JOHN L. TRAIN, President and General Manager, Utica Mutual Insurance Company.

2:00—"The Present Status of Sulfathiozole"—CHARLES HENRY RAMMELKAMP, M.D., Assistant in Medicine, Boston University School of Medicine, Boston.

Discussion:

D. R. CLEMINKO, Rensselaer, Pharmacologist, Winthrop Chemical Co., Albany.

3:00—"The Care and Management of Spinal Cord Injuries"—BYRON SROOKEY, M.D., F.A.C.S., Surgeon in Chief, The Neurological Institute of New York; Consulting Neurological Surgeon, St. Luke's Memorial, Nassau, New Rochelle and Middlesex General Hospitals.

Discussion:

ELDRIDGE H. CAMPBELL, M.D., F.A.C.S., Attending Surgeon, Albany City Hospital; Consulting Surgeon, Green County, Memorial and Mary McClellan Hospitals, Albany.

C. H. BALDWIN, M.D., F.A.C.S., Surgeon in Charge, Crippled Children's Hospital, Utica.

At the business session, DRS. RAYMOND C. ALMY, JOHN L. NORRIS, and F. C. SABIN were chosen as Directors for the three-year term, and DR. O. A. Brenenstuhl for the one-year term. DR. H. H. BAKER, of Rochester, was elected President; DR. O. A. BRENENSTUHL, of Albany, First Vice-President; and DR. RAYMOND C. ALMY, of AUBURN, Second Vice-President and Treasurer. The meeting was well attended, and the manner in which the program subjects were handled made it one of the most interesting in the history of the Society.

Chicago Society

THE CHICAGO SOCIETY OF INDUSTRIAL MEDICINE AND SURGERY held a Scientific Meeting at 8:30 P.M on Monday, November 4, 1940, at Medical & Dental Arts Building, Chicago, with the following program:

"Lesions of the Back Mistaken for Trauma"—JOHN D. ELLIS, Chicago, Illinois.

"Evaluation of Manipulative Therapy for Back Conditions"—FREDERICK A. JOSTES, Associate Professor Orthopedic Surgery Washington University, St. Louis, Missouri.

Motion picture illustrating manipulative therapy.

Central States Society

THE CENTRAL STATES SOCIETY OF INDUSTRIAL MEDICINE AND SURGERY will hold an all-day Clinical Meeting at Chicago on December 6, 1940, at St. Lukes Hospital, with the following program:

9:00—Pathological Demonstrations, DR. EDWIN I. HIRSCH and the hospital staff.

10:00 to 12:00—Clinics:

DR. W. A. GUSTAFSON, Spinal Cord Injuries.

DR. FREMONT CHANDLER, Spondylolisthesis.

DR. ROLAND MACKAY, Mental Conditions Associated with Injuries.

DR. WILL LYON, Hernia in Industry.

12:00 to 2:00—Luncheon.

2:00 to 5:00—

DR. CLEVELAND J. WHITE, Industrial Dermatitis.

DR. HARRY CULVER, DR. GEORGE APFELBACH, DR. JAMES J. CALLAHAN, DR. JAMES JACKSON (Madison, Wisconsin), and DR. O. A. SANDER (Milwaukee, Wisconsin), subjects to be announced.

DR. CLAY R. MURRAY, of New York, will be the speaker at the evening Dinner Session.

Industrial Medicine
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The Journal of Traumatic Surgery and Occupational Diseases

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Keep the Gains!

ON ACCOUNT of the tender age of industrial medicine at the time of the first World War, it is true, as DR. LEVERETT BRISTOL says,* that there is not much of wartime precedent or experience on which to formulate a national defense industrial health program. "The whole specialty of industrial health as we know it in this country is at the present time only a little over 25 years old . . . ." But the nature of the possibilities which make the national defense so important, deprives the lack of precedents of any significance. For the immediate situation is one in which "our chief defense will be our industrial skill," and the availability of that skill and the continuity of its application will be the measure of our man power. To keep these at their maximum, the medical profession, which, in the last World War, was mobilized for repair, in this one is mobilizing for prevention: "the preservation of expert workers . . . the development of additional skilled workers . . . . reducing lost time due to occupational and non-occupational illness and accidents . . . ." studying "unfavorable environmental factors in the production of war equipment and munitions . . . . strengthening and broadening the entire industrial health program all along the line. . ."

This mobilization is finding expression in the coordination of efforts through medical organizations and committees. Among the latter is the Health and Medical Committee of the Council of National Defense, of which DR. IRVIN ABELL, of Louisville, Kentucky, former A.M.A. President, is chairman. This committee has just announced its Subcommittee on Industrial Medicine, with DR. CLARENCE D. SELBY, medical consultant of General Motors, Detroit, as chairman, and other members including PROF. PHILIP DRINKER, Harvard School of Public Health, Boston; DR. E. C. HOLMBLAD, Chicago; DR. GEORGE M. SMITH, Yale University Medical School, New Haven, Connecticut; DR. LLOYD NOLAND, chief surgeon, Tennessee Coal, Iron and Railroad Company, Fairfield, Alabama; MR. WILLIAM P. YANT, Mine Safety Appliances Company, Pittsburgh, and DR. A. J. LANZA, of the Metropolitan Life Insurance Company, New York.

The scope of the work of all the industrial physicians and surgeons represented in and by the foregoing committee and all other committees cooperating in the national defense program is well set forth by DR. BRISTOL. "Man power" (and we suggest that this be thought of in terms of industrial skill) "is now the greatest need both of industrial production and of military defense. Adequate man power is dependent on the highest type of mental and physical fitness; nor should the health of women workers be forgotten in these times, in view of their important contributions to industrial production and operation and their possible substitution for men in times of serious national emergency. The speed-up of production and manufacture, the development of new material and methods, the increased employment of new workers unused to the hazards of industry will require new industrial health routines and regulations, more intensive study and research in the field of occupational diseases and industrial poisons and the extension and improvement of all health and safety education. To speed the work but to spare the worker should be our aim!"

All of this, however, is only a stepping-up, an intensification, of the best in peace-time industrial medicine. It needs no precedents of war to make it effective; it needs only the acceleration of its previous growth—and the necessity for defense in a hurry is supplying that. And whatever the eventuality—continued peace, or active war—industrial medicine will have moved with giant strides and incalculable improvements and developments will have come to pass. It will have reached a new high in quality and effectiveness, and a spread in application to industries large and small which will multiply its value many times over as compared with even a year ago.

Let us hope that when the crises which move to arms are past, and "the tumult and the shouting die, and the captains and the kings depart," no single expression of anything industrial medicine shall have gained—in quality or scope—may be laid aside or abandoned, but, on the contrary, that everything in which it shall have advanced may be kept as a continual benefaction to the millions it serves and a permanent addition to its ability to serve them.

* "Industrial Health and National Defense," by LEVERETT D. BRISTOL, M.D., DR. P.H., in *J.A.M.A.*, October 12, 1940.

INDUSTRIAL HEALTH AND DISEASE

Industrial Medicine

—From the Standpoint of the Internist—

LORENZ W. FRANK, M.D.,
Denver, Colorado

THE occupation of a patient is an important point in the history and may directly or indirectly indicate the cause of the disability. In discussing industrial disease from the internist's viewpoint, it is necessary to define what is meant by the term and also the role of the internist in dealing with the problem. The industrial worker is subject to all the ills of mankind, and, on account of his environment, is more liable to contract many of them than are other individuals.

An industrial disease is one which is directly caused by the occupation of the worker — for example, lead poisoning in an individual engaged in the manufacture of storage batteries where the atmosphere contains more than 1.5 milligrams of lead dust per 10 cubic meters of air. There is some evidence that primary carcinoma of the lungs often found in the miners of Schneeberg and Joachimsthal may be due to the inhalation of arsenic. Also, it has been observed that workers in a du Pont plant where certain naphthalene compounds are handled often developed carcinoma of the bladder. The two latter instances, of course, are questionable. The nature of an occupation may be a predisposing cause of such a disease as pneumonia. Studies of industrial morbidity among iron and steel workers conducted by the U. S. Public Health Service[1] showed that pneumonia, in all forms, occurred to nearly twice the extent among these workers that it did among employees of other industries during a three-year period of observation. The highest rates occurred among the workers in the blast furnace and open hearth steel mills; they were more exposed to such factors as heat with wide changes in temperature, gases (sulphur dioxide, hydrogen sulphide, and carbon monoxide), dusts, strenuous work, and outdoor labor in all kinds of weather.

An already existing disease may be aggravated by the occupation of the worker. An arrested tuberculosis may be reactivated or strenuous effort may cause a pulmonary hemorrhage. In the same way, cardiac decompensation may be produced.

Until quite recently, industrial medicine meant industrial surgery; the industrial diseases were treated by the surgeons as a side line. But as the panorama of the new deal unfolded, there were extruded many old problems which had hitherto been ignored or overlooked. The recognition and treatment of occupational disease is strictly within the province of the internist, but still more important is his cooperation with the sanitary engineer in their prevention. The physician must diagnose occupational diseases and point out their existence in the environment of a given industry. Then the engineer can apply his control measures, such as proper ventilation, enclosure, wet methods, respirators, protective clothing, etc.

New methods and new materials are constantly being introduced into industry; these often have a deleterious effect upon the health of the workers. These effects may be obscure and overlooked until they produce serious disease. It is the function of the internist to study the methods and materials used and to investigate their early effects upon the health of the workers. The effects of some of these materials may be very obscure, and prolonged observation necessary to connect them with symptoms exhibited by workers. For example, an employee of a soap factory, where abrasive soaps are manufactured, may have an early penumonoconiosis manifested as a slight bronchitis. Benzene, used as a solvent in paints or waterproofing mixtures, may cause bronchial irritation or the more obscure blood changes, anemia or leucopenia, which are often not thought of in this connection. The periodic determination of the relative proportions of the inorganic sulfate, in the urine of employees exposed, may indicate a possible benzene hazard.[2] Bronchial asthma may result from the inhalation of sulphur dioxide and, in the more severe and prolonged cases, necrosis of the respiratory tissues results. Metal fume fever produces symptoms that are transient and easily confused with influenza unless the occupation of the individual is kept in mind. This occurs in the founding of brass or in any operation where zinc is heated to high temperatures. Workers who clean the inside of large retorts in which these metals have been roasted are subject to this condition. Symptoms that result from changing barometric pressure are also very important in industry. Caisson disease can be fairly well handled, but the changes resulting from very high altitudes present an unsolved problem. To keep the human element abreast of the mechanical progress is one of the chief problems of aviation medicine.

Lead poisoning, one of the oldest and most common industrial diseases, depended for its recognition largely upon well developed symptoms. Some of these were headache, a lead line on the gums, constipation and abdominal cramps, various encephalopathies, and stippling of the red blood cells. Kehoe[3] has formulated a plan for the prevention of lead poisoning in industry and says that this depends primarily upon the recognition of dangerous lead exposure. Most types of lead exposure can be controlled by modern hygienic and engineering safeguards. Careful clinical study of the population of a plant may discover some early cases, those with headache, a faint lead line on the gums, indefinite gastrointestinal complaints, or an increase in the punctate basophilia of the erythrocytes may be incipient cases of saturnism. For proper prevention, however, these studies must be supplemented by the determination of the lead content of the air in working spaces. There is considerable evidence for the belief that the inhalation of from 1.5 to 2 mg. of lead per day will cause poisoning in many individuals. Furthermore, measurement of the lead excretion shows a definite relationship to the severity of exposure. Analysis of suitable samples of feces indicates the amount of lead which has been entrapped in the upper respiratory passages and swallowed. Examination of samples of the urine shows in a general way the amount of lead absorption. Thus, early and unsuspected cases may be discovered and preventive measures instituted before the symptoms of severe intoxication make their appearance.

Such studies can be and are being carried out in the larger plants, those that employ five hundred or more men. They usually have a well organized health service with adequate medical personnel. However, in the smaller plants that employ one hundred men or less, the problem becomes more difficult. The great majority of workers are employed in these small plants, and it is not practical for the management to maintain a full time medical service. Here, then, is the place for the private practitioner to be of service to both the employer and employee. A survey of the plant for the purpose of finding and pointing out health hazards and periodic examinations of the workers may prevent a great

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deal of sickness and loss of time. The health of the worker is conserved and disorganization of the plant is prevented to the great benefit of both employer and employee. The mutual advantage to be derived from such a plan must be fully understood by both the management and employee, so that through cooperation of all concerned the greatest good may result. Such a plan is also far more economical than the common practice of dealing with sickness or injury after it has become an established fact. Unavoidable injuries and sickness must of course be dealt with, but there would be far less of these if a preventive program were seriously carried out.

I have purposely avoided mention of the economic aspects of this problem, and while it is undoubtedly the major feature at the present time, still its solution will be facilitated by keeping in mind and working away at the basic problem, namely, the conservation of the health of the worker.

The pneumoconioses are classical examples of industrial diseases, and of these silicosis is the one which has attracted most attention. Since the only treatment of silicosis is prevention, a great mass of literature has accumulated which has to do largely with the etiology and pathogenesis of the disease. From these studies, a number of factors have been shown to be of importance for the development of silicosis, such as the length of time of exposure to dusts, the silica content of the dust, the size of the particles and the concentration of the particles. It is generally conceded that silicosis is most likely to develop in an atmosphere containing a concentration of 20,000,000 particles per cubic foot of air, that the particles be less than five microns in diameter, and that the dust contain more than 20% of uncombined silica. When the particles are greater than 10 microns in diameter, very little tissue reaction results. The rate and extent of tissue reaction are inversely proportional to particle size. The majority of particles found in silicotic lungs are about one micron in diameter. The question as to whether the irritation of the lung tissue is caused by the mechanical action of the hard sharp silica bodies or whether it is due to a physiochemical irritation is not settled.

Gardner[4] sums up the question as follows: Regardless of the mechanisms involved, all the experimental evidence tends to confirm the belief that fibrosis is to be expected only from various forms of free silica and from those silicates which have a fibrous structure, i.e., asbestos. The free silica need not necessarily be of crystalline form; one of the amorphous varieties has proved as active as normal quartz, although others were practically inert. A few of the silicates are toxic; others have produced mild degrees of cellular proliferation. If any of them ultimately cause fibrosis, such reaction must be extremely slow in development. Particles of certain other minerals naturally or artificially associated with free silica delay the development of silicotic fibrosis and modify its form. Whether all nonsiliceous minerals may act as inhibitors awaits demonstration. Definite proof of accelerators to the action of silica is yet lacking; it has been suggested that cases of "rapid silicosis" in human beings may be due to excessive exposures to silica of unusual fineness with or without associated infection.

The Canadian observers, Denny, Robson, and Irwin, showed that the addition of metallic aluminum to quartz dust prevented silicosis in rabbits. Silicosis developed in six rabbits exposed to quartz dust for six months. The condition did not develop in seven rabbits exposed to quartz dust plus 1% metallic aluminum powder for the same period. The authors state that metallic aluminum, on being converted into hydrated aluminum, reduces the toxicity of quartz in tissues by flocculation by absorbing silica from solution, but chiefly by coating the quartz particles with an insoluble and impermeable coating.

On the clinical side, interest has been focused chiefly upon the question of early diagnosis and the complication of silicosis by tuberculosis or other infections. In diagnosis, the x-ray is of the utmost importance, and is practically the only means of discovering early cases. A committee of experts reporting through the U. S. Public Health Service[6] have formulated and tabulated the x-ray appearance in silicosis, correlating this appearance with the underlying pathological lesions. The simple forms of nodular silicosis are not difficult to recognize, but the advanced disease with massive homogeneous shadows is difficult to differentiate from tuberculosis.

The association of tuberculosis and silicosis has led to a good deal of confusion, due mostly to the nomenclature used. Gershon-Cohen and Cohen[7] suggest that the term tuberculosilicosis be applied to symptomless cases of infective silicosis, that is, in those in which the infective period has been relatively short. Then, the term silicotuberculosis might be reserved for the frankly tuberculous process associated with silicosis when the bacteriologic diagnosis of tuberculosis is positive. The belief that tuberculosis is usually responsible for the fatal ending in silicosis is widespread. Riddell stated that tuberculosis is the most common and most important complication in silicosis and is responsible for the majority of deaths among silicotics. Lanza[8], who has had a wide experience, says, "The death rates from tuberculosis among men in occupations in which there is exposure to free silica so far exceed those found for men in other pursuits, as to leave little room for doubt that silica is implicated." Ornstein[9], on the other hand, believes "that the question of tuberculosis in silicosis is not definitely settled and requires more thorough investigation than in the past. There must be a departure from the method of depending on the x-ray in the diagnosis of tuberculosis in silicosis, and we must now turn to the laboratory for the demonstration of tubercle bacilli in the sputum and to the postmortem confirmation of the diagnosis of clinical tuberculosis in silicosis when tubercle bacilli are not demonstrable in the sputum."

Even at postmortem, it is sometimes difficult to determine the presence of silicosis, and particularly the type of silica causing the disturbance. To aid in this direction, Sweany and Klaas[10] have developed a method of x-ray diffraction analysis of dry powdered lung tissue. They found that by this x-ray method, nearly all crystalline compounds give patterns distinctly different from all others and that the patterns are highly specific for all the different kinds of dust. They also hope to apply this method to the detection of quartz in sputum as a diagnostic aid.

The relationship of tuberculosis to industry is another important question, i.e., the activation or reactivation of a tuberculous process. The primary infection, except in rare instances, can not be directly connected with industry. According to Goldberg[11], the question is this: Does pulmonary tuberculosis develop after a trauma to the chest—individuals who were apparently healthy prior to the injury and who had been able to work constantly? In such cases, trauma to the chest with or without evidence of contusion, and with or without a fracture of the ribs, may be the activating factor. In those cases in which a trauma is accompanied immediately, or within a short space of time, by hemoptysis, the relationship is fairly clear. If pulmonary symptoms develop within four weeks after trauma, and if a diagnosis of tuberculosis is made within six months, it is reasonable to assume that the injury was the cause. The length of the period of disability to which such an individual is entitled is the hardest point to settle. Goldberg believes that, if, after adequate treatment, the symptoms disappear, and the radiographs show that the process in the lungs has healed and has remained healed for a period of six months, the disability ought to be considered as terminated.

The most difficult type of case to evaluate is the one in whom there was positive evidence of tuberculosis prior to the injury, but one in which the patient had been apparently well for a year or more before the injury. In this class of cases, the injury must be considered as a reactivating fac-

tion of which is made difficult in an unconscious patient, or appliances and bandages may interfere with thorough examination. Pneumothorax or hemopneumothorax must be recognized quickly and adequate treatment instituted. It may be necessary to aspirate air from the thorax intermittently or continuously until proper pressures have been restored. Empyema may develop and be overlooked under such circumstances.

Certain infectious diseases such as typhoid, undulant fever, tularemia, anthrax and tetanus may be classed as vocational diseases. Typhoid may be contracted by dairymen or creamery workers and these individuals may also act as carriers as a direct result of their occupation. Undulant fever has been found in meat packing plant employees, in dairymen, herdsmen, farmers and others employed in stock raising or handling meat or dairy products. Anthrax, tularemia, and tetanus occur usually in farmers or stock raisers. These infections are not so common in these days of preventive medicine, but occasionally a reservoir of infection is found through the alertness of the physician or health officer and may be very important to the industry involved even though it is a small establishment. The protean manifestations of allergy, which occur commonly among industrial workers, present a constant problem which often can be solved only by a thorough understanding of the working environment.

Heart disease in the accepted meaning of the term is not an industrial disease, but patients with heart disease who are employed are a great responsibility for the internist. After decompensation has been corrected, the most difficult and important task confronting the physician is to find and institute a regime that can be carried on by the patient with safety —some change in the old occupation or a new one at which he can make a living in spite of his handicap. The mental readjustment is not the least of the problems to be solved. To persuade the timid individual that he can work at the kind of work prescribed, may be just as difficult as it is to hold down the aggressive one. If such a person has disability insurance, the problem may be still more complicated. The old idea that heart disease means complete and prolonged rest is no longer acceptable, i.e., in those old cases that have been decompensated several times. Recent cases of rheumatic fever can avoid cardiac damage only by prolonged rest. After an insufficient heart muscle has been restored as much as possible, suitable amounts of activity can be allowed, just enough to avoid further damage, but enough to keep him contented. The business executive with coronary occlusion, after he has been at complete rest for about three months, may return to his work with a two-hour rest period in the middle of the tor. However, it must be remembered that hard work without injury, work which the patient has voluntarily undertaken, may produce the same course of events.

Crushing or penetrating injuries to the chest are common industrial accidents, and here the internist can aid the surgeon. Circulatory collapse requires his best judgment. Pneumonia frequently develops quickly after such an injury, early recogni-

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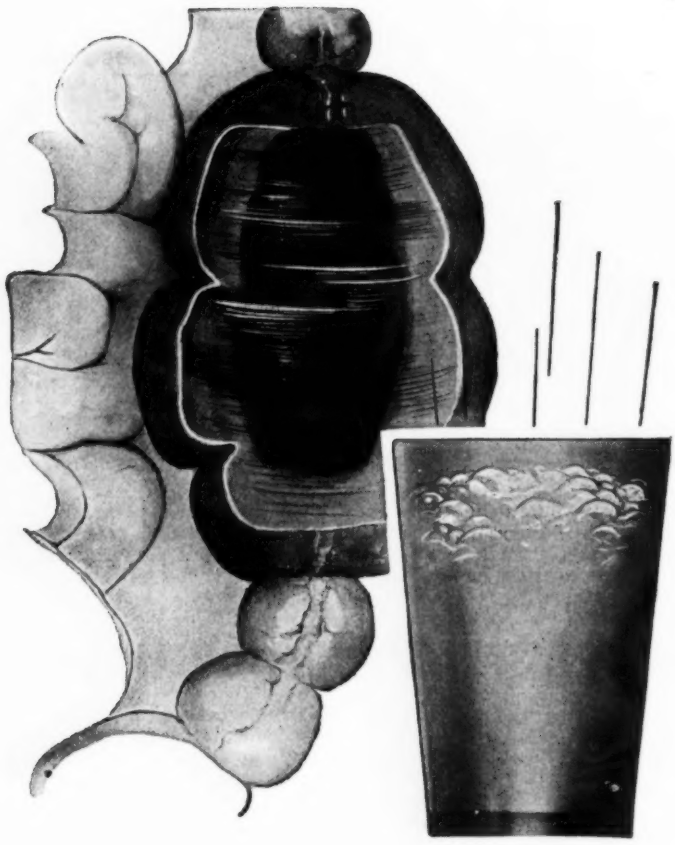

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day. Cases of coronary thrombosis resulting from trauma have been reported by Boas[13].

A man 52 years of age, the manager of a lumber yard, originally had a mitral stenosis which resulted in decompensation many times. His work required considerable physical effort and heavy lifting at times. He attempted to overcome his disability by moving from one locality to another, putting much emphasis on lower altitudes until he was finally compelled to enter a hospital. He promptly recovered from this decompensation, and after resting at home for three months, he secured a clerical position in a city office. This type of work he has been able to do without discomfort for more than a year. The demonstration that he is still able to make a living has given him a new lease on life.

The magnitude of the problem of industrial medicine can be more clearly comprehended if we know that more than 2000 substances used in industry are potential causes of disability. A valuable study has recently been made in Colorado by the State Board of Health[15] for the purpose of evaluating the industrial hygiene problem in the state. According to the 1930 census, Colorado had 402,894 workers gainfully employed, and of this number, 170,981 were employed in the industrial and service groups from which the sample for study was selected. A representative sample of 31,130 workers was surveyed, listing the type of industries, size of plants, industrial health provisions, safety provisions, medical provisions, control of venereal and other communicable diseases, disability benefits and records, comparison of health services in small and large plants, sanitary facilities, occupational exposure to specific materials, and application of control methods. Materials and physical conditions of a potentially hazardous nature, encountered by workers in the occupations surveyed, were grouped under fifty-one class designations, and over two hundred examples of materials included under each specific or general classification. The study is intended as an evaluation of the problem and to be used as a foundation for future studies.

The world-wide interest in industrial medicine is apparent through the many organizations which have in recent years taken a renewed interest in the subject. The international congress on industrial medicine meeting in Paris under the patronage of government officials discussed a wide variety of subjects. In this country, the Annual Congress on Industrial Health authorized by the American Medical Association held its first meeting in Chicago January 9 and 10, 1939. The program of this meeting concerned itself chiefly with an outline and definition of the problems in this field and to point out the relationship of the practicing physician to management and industrial medical officer. Many other organizations such as the U. S. Public Health Service, the American Public Health Association, the Bureau of Mines, the Association of Heating and Ventilating Engineers, the American Association of Industrial Physicians and Surgeons, and many others are taking an active interest in this work. The vastness of the problem challenges the interest of all physicians. It is the special sphere of the internist to point out industrial hazards and to search for new and unrecognized disabilities that result from the use of new materials and methods that are being introduced into industry.

Dr. Carey P. McCord[14] has pointed out that the private practitioner should somewhat change his attitudes toward the services that he may render the industrial workman, losing sight to some extent of his immediate injury and instead render his services to the workmen as a whole, to his employer, and to the community.

References:

1. BLOOMFIELD, J. J.: Engineering Control of Occupational Diseases. U. S. Public Health Reports. May 22, 1936. Vol. 51. P. 655-677.

2. KAMMER, A. G., Isenberg, Na-

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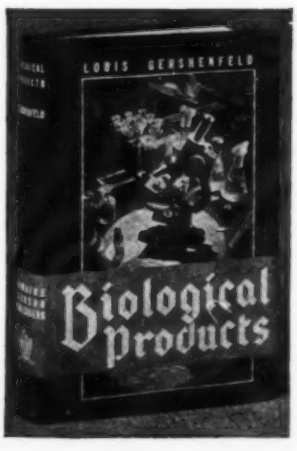

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than, and Berg, Melvin E.: Medical Supervision of Benzene Plant Workers. *J.A.M.A.* Oct. 15, 1938. Vol. III. P. 1452.

3. KEHOE, ROBERT A.: Recognition and Prevention of Lead Poisoning. *Surgery, Gynecology and Obstetrics.* Feb. 15, 1938. Vol. 66. P. 444.

4. GARDNER, LEROY U.: Etiology of Pneumoconiosis. *J.A.M.A.* Nov. 19, 1938. Vol. 111. P. 1925.

5. DENNY, J. J., ROBSON, W. D., and IRWIN, D. A.: Prevention of Silicosis by Metallic Aluminum. *Canadian Medical Journal.* March, 1939. Vol. 40. P. 213.

6. U. S. Public Health Report. 1935. Vol. 50. P. 990.

7. GERSHON-COHEN, JACOB, and COHEN, LOUIS: Hematogenous Tuberculosis and Silicosis. *J.A.M.A.* Feb. 18, 1939. Vol. 112. P. 602.

8. LANZA, A. J., and VANE, R. J.: Industrial Dusts and the Mortality from Pulmonary Disease. *American Review of Tuberculosis.* April, 1939. Vol. 39. P. 419.

9. ORNSTEIN, GEORGE G.: Silicosis and Silicotuberculosis. *Medical Clinics of North America.* Sept., 1938. Vol. 22. P. 1443.

10. SWEANY, H. C., and KLAAS, ROSALIND: X-Ray Diffraction Analysis as Applied in Pneumoconiosis. *J.A.M.A.* Feb. 18, 1939. Vol. 112. P. 610.

11. GOLDBERG, B.: Clinical Tuberculosis. 1935. Vol. 2. P. K. 69.

12. BOAS, ERNEST P.: Angina Pectoris and Cardiac Infarction From Trauma or Unusual Effort. *J.A.M.A.* May 13, 1939. Vol. 112. P. 1887.

13. State Board of Health: Evaluation of the Industrial Hygiene Problem of the State of Colorado, 1939.

14. MCCORD, CAREY P.: Official Notes, Annual Congress on Industrial Health. *J.A.M.A.* Feb. 25, 1939. Vol. 112. P. 741.

Abstract of Discussion

C. R. MULLER, M. D. (Salida): Having been connected with industrial surgery for some twenty years, I feel that diseases such as silicosis should be compensable. If the miner develops silicosis, it means the end of his work. It may be work that he has been engaged in for years and he can do nothing else. Has any attempt been made in Colorado to make it compensable?

W. B. YEGGE, M.D. (Denver): There is one disease mentioned that interested me, namely, lead poisoning. Twelve years ago I went to a battery plant in Denver to find out the cause of the large amount of lead poisoning taking place there. Lead poisoning is not a disease in which the Industrial Commission will pay, but the employer wanted to find out what was wrong.

A careful study was made of this plant by making blood slides on every man and a careful study of the gums of every new man who went to work as well as those who were already employed. Some 150 cases were studied in this way. It was interesting that some of those men had worked for a long time and showed no changes, while some men working only a week would begin to show stippling and polychromatophilia in the blood. Upon investigating we found that those men who early showed these changes were simply careless. They would chew tobacco while at work, or eat a candy bar, and we had a hard time getting them to discontinue this habit.

The main point we found from these studies was that the presence of the oncoming lead poisoning could be determined by studying these workers' blood. Stippling would appear before any symptoms. So just as soon as any man would begin to show stippling, he was investigated and usually let go because it was due to some carelessness on his part rather than to the sanitary condition of the plant. In that way, by simply training the men, the last 10 years has developed very few cases of lead poisoning in this plant.

There is one other factor in these cases that we see in practice and many of them are missed because the history is not carefully taken. We see some gastro-intestinal disturbances that can be traceable to lead if the examining physician carefully

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takes the history and finds out what the man's occupation is.

DR. FRANK (Closing): As far as I know, there is no industrial disease compensable in Colorado. There are eight or nine states that have included all industrial diseases exactly the same as they handle injuries. In Wisconsin, in particular, a compensation law has been on the books since about 1911. I am not sure whether they have included the industrial diseases during all that time or not, but they have found that inclusion of industrial diseases in their compensation (as compensable cases) increased the cost to the insurance company or to the other carriers 1%—that is, if the disease is strictly and definitely an industrial disease.

What applies to lead poisoning applies to a great many other of the materials that we have to deal with in treating a person who has or who is supposed to have an occupational disease. It is largely a matter of keeping in mind his working environment and to make those investigations which might point the way, particularly blood examinations, urine examinations and other special investigations that may point the way in determining whether or not he was suffering from something that he came in contact with in his work.

Form 3526.—Ed. 1933

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

OF INDUSTRIAL MEDICINE, published monthly at Beloit, Wisconsin.
STATE OF WISCONSIN } ss.
COUNTY OF ROCK }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Clinton F. Karstaedt, who, having been duly sworn according to law, deposes and says that he is the Sec.-Treas. & Business Mgr. of INDUSTRIAL MEDICINE, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are:

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Managing Editor: Mr. A. D. Cloud, Chicago, Illinois.
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—C. F. KARSTAEDT.

Sworn to and subscribed before me this 4th day of October, 1940.
GRACE E. TROON, Notary Public.
(SEAL) (My commission expires Feb. 22, 1942.)

Highway Hostesses

A NEW type of industrial nursing service, that of highway hostess, has been inaugurated in the State of Oklahoma according to an article appearing in the July issue of *The Oklahoma Nurse.** The Phillips Petroleum Company has employed 11 graduate nurses to cover the main highways along the routes where its 66 service stations are located. They make sanitary inspections of the station rest rooms, consult with the attendants, and make recommendations. They must not only know the needs of travelers but must be able to give information about traffic laws and regulations, places to eat, and the cleanliness and comfort of hotels and camps, and places of interest in the area. Each hostess is furnished with a car and travels alone.

*From *Public Health Nursing*, November, 1940.

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